City of Chelan Municipal Sewage Treatment Plant
Class II Inspection, July 27-29, 1992

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ABSTRACT

A Class II Inspection was conducted in July 1992, at the city of Chelan Sewage Treatment Plant in Chelan County Washington. The Chelan facility is an RBC secondary treatment plant with both anaerobic and aerobic digestion of sludge. The plant is unusual in that the primary treatment plant is separated from the secondary treatment plant by several miles. Inspection data found that Chelan was producing a fairly good effluent quality. Split samples comparison found relatively small differences between Ecology's and Chelan's analyses. Effluent concentrations were within NPDES permit limits with the exception of fecal coliform and chlorine residual. The facility also appeared not to be meeting the NPDES standard for 85% removal of BOD_5. Fecal coliform concentrations were greatly in excess of permit limits, indicating that chlorination of the effluent was inadequate. Plant effluent flow exceeded permit limits and influent flow exceeded 85% of the permit loading criteria. Flow measurement also identified potential problems with the effluent flow meter, a discrepancy between influent and effluent flow rates, and unequal flow diversion between the two sides of the RBC. Treatment across the primary clarifier appeared to be marginal. Most organic compounds in the effluent were well within both the EPA chronic and acute water quality criteria. Copper and silver exceeded both the acute and chronic EPA water quality criteria for receiving waters, and several other metals exceeded the chronic criteria. Bioassays found no acute toxicity, but the fathead minnow test did indicate slight chronic toxicity. Several recommendations for improved plant performance are made.

INTRODUCTION

A Class II Inspection was conducted at the city of Chelan Sewage Treatment Plant (STP) in Chelan County, Washington on July 27-29, 1992. Guy Hoyle-Dodson and Marc Heffner of the Washington State Department of Ecology's Toxic, Compliance and Groundwater Investigations Section conducted the investigation. Phelps Freeborn, municipal permit manager for the Department of Ecology's Central Regional Office, assisted during the inspection and provided background information. Operators for the Chelan facility Howard (Al) Merchant and Rick Simmons provided assistance on site.

The Chelan STP serves the city of Chelan plus several outlying sewer districts. During the summer the plant serves a large recreational tourist population. Much of this seasonal peak load is from restaurants, resorts, and summer homes. The plant discharges effluent to the Columbia River (Lake Entiat) just above the confluence of the Chelan River with the Columbia River. An NPDES Permit (No. WA-002060-5) was issued September 1984 with an expiration date of September 1989. The facility is operating under an administrative extension of that permit.

The Class II Inspection was scheduled to evaluate performance and loading concerns and to provide additional information for writing a new permit. Specific objectives of the inspection included:

1. assess NPDES permit compliance;

2. assess wastewater toxicity with priority pollutant scans and effluent bioassays;

3. evaluate treatment plant performance and plant design;

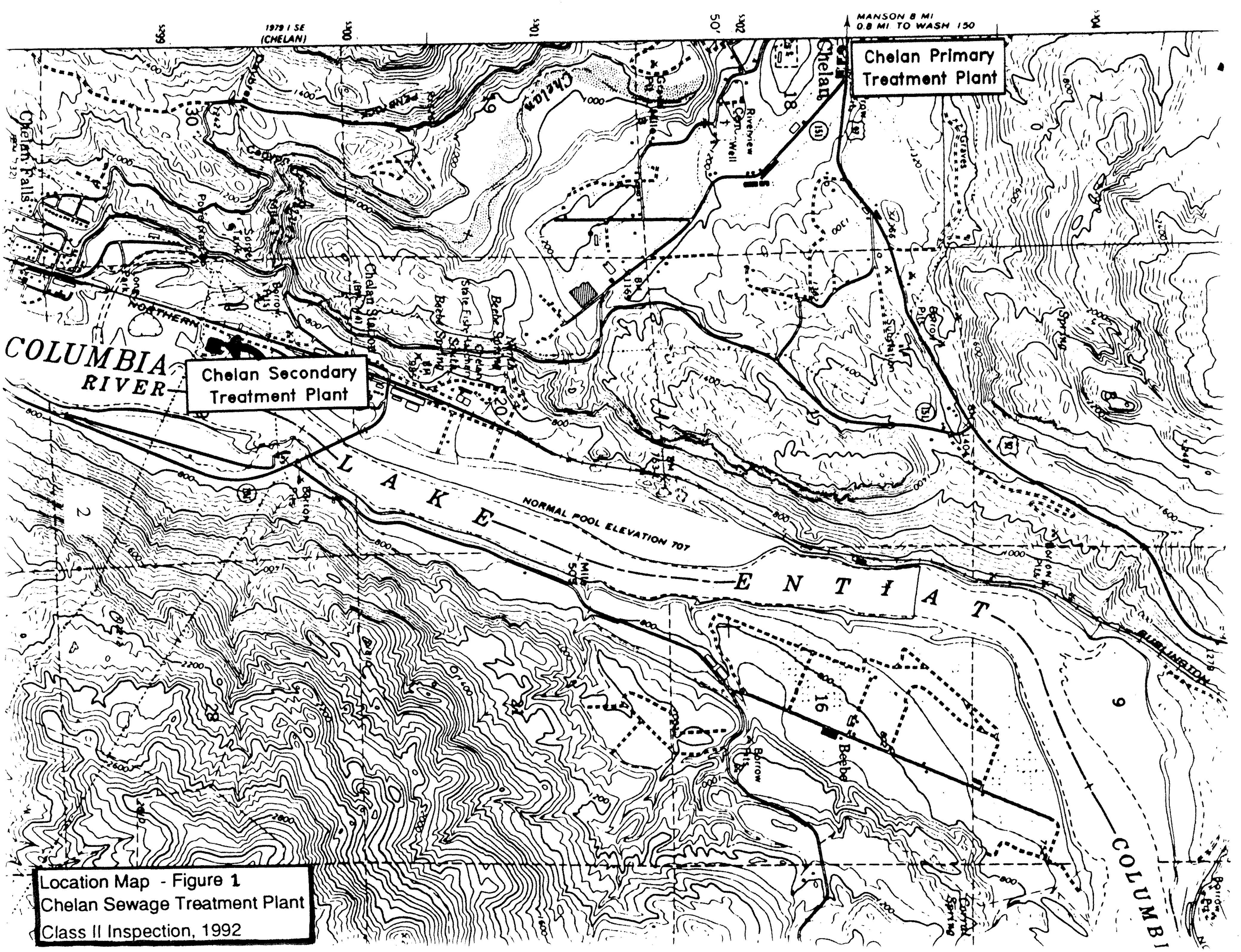
4. assess facility loading; and

5. evaluate permittee's self-monitoring including split samples analyses by the Ecology and Chelan laboratories.

SETTING

The Chelan STP is unusual in that the primary treatment system is separated from the secondary treatment system by approximately 2.5 miles. After primary treatment at the initial plant site, a pipeline transports wastewater to the secondary system located several hundred feet lower on the Columbia River near the community of Chelan Falls (*Figure 1*).

The city of Chelan constructed the initial STP in 1948 and incorporated modifications through the years. Prior to the 1987 upgrade, treatment was provided by an activated sludge



Location Map - Figure 1
Chelan Sewage Treatment Plant
Class II Inspection, 1992

system. Discharge was to the Chelan River below the Lake Chelan Dam. Due to the intermittent nature of flow from the dam, effluent dilution was often poor. Wastewater loads also exceeded plant capacity.

In 1987, the city of Chelan built a new rotating biological contactor (RBC) type secondary treatment facility at the Chelan Falls location. The city retained components of the original plant as a primary treatment facility. The upgraded facility discharges to the Columbia River.

The collection system includes numerous lift stations, especially for the mains along the Chelan lake shore (the South Shore and North Shore interceptors). The sewage is pumped to the primary plant located just east of the city of Chelan. At the time of the inspection the primary system consisted of the headworks with grit basin and comminutors, Parshall flume, primary clarifier, rotating screen, and the transfer lift station (*Figure 2*). Wastewater at the headworks passed through a Parshall flume where flows were measured by an ultrasonic flow meter. Flow was then routed through a primary clarifier to a rotating screen. Finally wastewater was pumped to the secondary treatment system. The pipeline route to the secondary system crossed a rise before descending, necessitating the transfer lift station.

Primary clarifier sludge was sent to the old anaerobic digester on the primary plant site. The digested sludge was hauled by tanker trucks and land applied.

The secondary system consisted of two parallel trains of RBCs (with four shafts per train), two secondary clarifiers, and a chlorine contact chamber (*Figure 2*). A diverter at the RBC inlet routed the wastestream from the primary system into left and right trains. The two streams merged then split once again to flow into two secondary clarifiers. Effluent from the two clarifiers was combined and passed through a Parshall flume before entering the chlorine contact chamber. Chlorinated wastewater passed an in-line flowmeter and discharged to the receiving water through an underwater pipe. An overflow channel allowed bypass of the effluent flowmeter during high flows.

Sludge generated by the secondary process was digested aerobically. Treated sludge was either deposited on drying beds or discharged to tanker trucks for land application. The eventual destination of dried sludge is to be either a landfill or agricultural application.

PROCEDURE

Ecology collected both grab and composite samples at the STP. Composite samples were collected from wastewater at several stations (*Figure 2 & Appendix A*); including influent, primary clarifier effluent, influent to the RBC, and chlorinated effluent. All composite samples were collected using Ecology ISCO composite samplers with equal volumes of the sample collected every 30 minutes over a 24-hour period. Grab samples were collected at all composite stations, as well as several other sites.

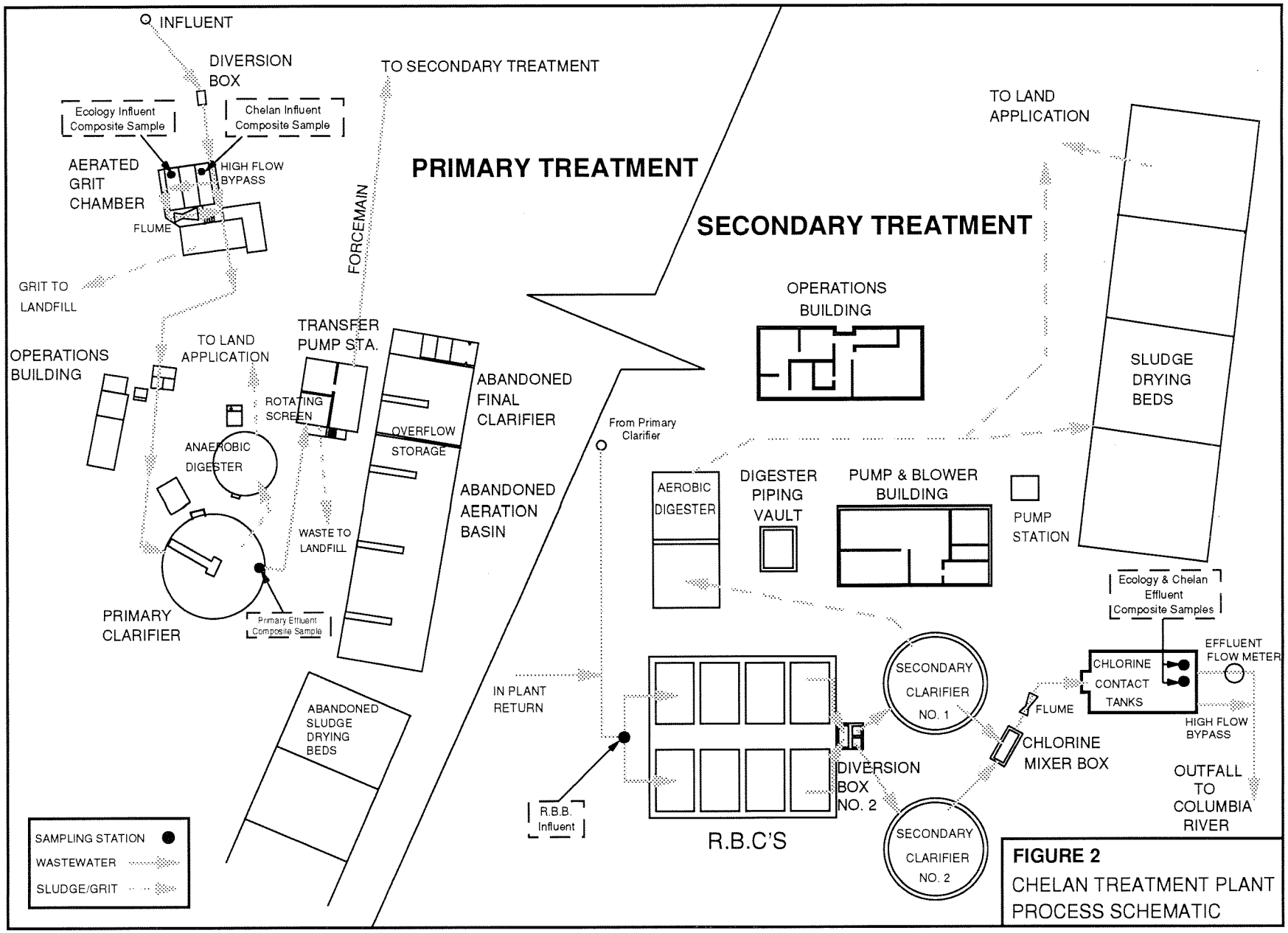


FIGURE 2
CHELAN TREATMENT PLANT
PROCESS SCHEMATIC

Chelan STP personnel collected composite samples from the influent at the headworks and from the effluent at the outfall from the chlorine contact chamber. Chelan's compositors were set to collect samples equivalent to those collected by Ecology's composite samplers. Sampling periods and volumes replicated Ecology sampling procedures.

Ecology and Chelan composite samples were split for analysis by both Ecology and Chelan laboratories. Also, the primary clarifier effluent composite sample was split into two subsamples and one was submitted as a blind duplicate to the Ecology laboratory. Parameters analyzed, samples collected, and the sampling schedule appear in Appendix B.

Samples for Ecology analysis were put in appropriate containers and preserved as necessary. The samples were packed in ice and delivered to the Ecology Manchester Laboratory. Analytical procedures and laboratories performing the analyses are summarized in Appendix C.

QUALITY ASSURANCE/QUALITY CONTROL

Sampling

Sampling quality assurance included priority pollutant cleaning of sampling equipment (*Appendix D*). One duplicate of a composite sample was taken to assess sample splitting and analytic consistency. Sampling in the field followed all protocols for holding times, preservation, and chain-of-custody set forth in the Manchester Laboratory Users Manual (Ecology, 1991).

General Chemistry

All samples were received in good condition. All analyses were performed within specified holding times. Precision data, instrument calibration, spiked recoveries, standard reference material, and external verification standards were all within appropriate control limits. Procedural blanks were generally acceptable. Exceptions were:

> Total suspended solids (TSS) were detected in procedural blanks used for these samples. The laboratory qualified these samples with the "B" qualifier to indicate blank contamination.

Metals Analysis

All analyses were performed within specified holding times. Initial and continuing calibration verification standards were within acceptable control limits. Procedural blanks were generally acceptable. Exceptions included:

Mercury and cadmium were detected in blanks associated with water sample analyses. Mercury was detected in blanks associated with the sludge sample analysis. The laboratory qualified these samples with the "B" qualifier to indicate blank contamination.

VOAs, BNAs, and Pesticides/PCBs

For all matrices, sample and extraction holding times were acceptable. Matrix spike, matrix spike duplicates, and surrogate spiked recoveries were generally within acceptable limits. The laboratory qualified those outside acceptable limits with a "J" qualifier. Procedural blanks were generally acceptable. Exceptions were:

The detection of low levels of some target compounds in laboratory blanks associated with both water and sludge samples. The EPA "five times rule" was applied to these samples. This rule stipulates that detected compounds are considered real and not the result of contamination if levels in the samples are greater than or equal five times the levels detected in the blanks.

Bioassays

Control results and test environment data (pH, temperature, etc.) were within acceptable ranges for rainbow trout, fathead minnow, and Microtox bioassays.

One problem was noted in the *Ceridaphnia dubia* survival and reproduction test. Due to the failure of control reproduction to meet protocol validation, the lab extended the 7-day test to 10 days. This extension still failed to meet reproduction requirements, but a review of the data showed that: 1) responses met other necessary requirements, and 2) there was an absence of toxic response. The data were therefore deemed acceptable.

RESULTS AND DISCUSSION

Flow Measurements

Chelan measures both influent and effluent flows. Influent is measured with an ultrasonic meter in conjunction with a six-inch Parshall flume located just downstream of the comminutor at the headworks. Secondary effluent can be measured at a Parshall flume located between the secondary clarifiers and chlorine contact basin, and by an in-line meter located in the outfall line downstream of the chlorine contact basin. The effluent Parshall flume is not equipped with a flow meter. At the time of the inspection, the flow measured by the influent totalizer was generally used as the plant flow for NPDES permit reporting.

The influent flume was inspected by Ecology and found to be properly configured. Turbulence in the flume due to the proximity of the comminutor was of some concern. An

instantaneous flow measurement by Ecology (1.5 MGD) compared closely with the Chelan meter instantaneous measurement (1.42 MGD). The daily flow rate during the inspection was 1.04 MGD measured at the flume by Chelan's totalizer. Chelan plans to improve the influent flume along with the planned upgrade of the headworks.

The effluent flume was also inspected by Ecology and found to be properly configured. Ecology instantaneous measurements were first made August 28 at the flume every 30 seconds over a 30 minute period. Flows varied from 0.56-1.78 MGD for this period. Variations in the number of pumps used at the transfer lift station is the probable immediate cause of the flow fluctuations. The numerous lift stations in the collection system are likely the root cause of the observed surging. Changes included in the planned improvements to headworks may help dampen the surges.

The average effluent flow rate measured during a 10-minute period on August 29 was 1.39 MGD by Ecology at the flume and 1.27 MGD measured by the Chelan in-line meter. The measurements are within 10% of each other and the locations were slightly different, but the Chelan effluent measurement is still of concern. The existence of an effluent overflow bypass circumventing the in-line meter could result in inaccurate (too low) measurements of peak discharges. Disinfection in the flow proportional chlorination mode is tied to the effluent meter. Underchlorination at peak flows may result. The location of the in-line flow meter appears unsuitable to accurately measure effluent flows when the overflow bypass is being used. Replacement of the present in-line flow monitoring device with a meter located at the Parshall flume may be necessary if improvements to the upper plant do not decrease flow variability.

Chelan's effluent totalizer measurement for the 24-hour period during the inspection was 1.19 MGD. The influent flow reported by the influent totalizer for approximately the same 24-hour period was 1.04 MGD. Flow meters were not being calibrated on a regular schedule. It is advised that Chelan adopt a calibration schedule for the flow meters. Comparison of influent and effluent flows after both meters have been calibrated is suggested to determine if an investigation of the difference between the two is necessary.

Observation of the growth patterns on the RBCs suggested flow was not split equally between the two RBC trains. The right (facing downstream) train had heavier growth than the left. Ecology instantaneous flow measurements with a velocity-type flow meter found a 0.99 MGD flow rate to the right train and a 0.40 MGD flow rate to the left train. Unbalanced loading can decrease treatment efficiency and reduce effective plant capacity. The operator had previously suspected a problem and partially closed the valve to the right train at the splitter box. His attempt did not balance the flows. The outlet weir from the RBCs was adjusted during the inspection in an effort to correct the problem. Closer attention to properly balancing flow is recommended. A system of measuring flow sent to the two trains may prove helpful.

Uneven distribution of growth along the individual shafts was also noted. Addition of baffles to distribute the flow more evenly along the RBC shafts should be considered if uneven growth is frequently observed.

General Chemistry

Oxygen Demand Parameters

Reduction of oxygen demanding substances (BOD_5, BOD_{INH}, $BOD_{dissolved}$, COD, and TOC) across the plant was generally good, with some qualifications (*Table 1*). Ecology results showed a BOD_5 reduction from 132 mg/L in the influent to 26 mg/L in the effluent (80% removal). Although measurements of other oxygen demand parameters indicate plant effectiveness was more or less adequate, there is room for improvement.

Solids Parameters

Ecology composite samples showed a decrease in total suspended solids (TSS) from 167 mg/L to 23 mg/L across the plant. Ecology grab samples displayed a comparable average decrease.

Nutrient Parameters

Partial nitrification across the STP is well supported by the data. NH_3-N decreased from an average of 21.7 mg/L in the influent to 8.7 mg/L in the effluent. NO_2&NO_3-N increased by an average of 5.78 mg/L. Nitrification was accompanied by the expected associated reduction in alkalinity. Total phosphorous decreased by approximately 1 mg/L.

Split Samples

Split samples for laboratory analysis were limited to three parameters: TSS, BOD_5, and fecal coliform (*Table 2*). Although there were some minor inconsistencies between Ecology and Chelan analyses, overall agreement was good.

TSS

Influent and effluent data from both analyses agreed closely (*Table 2*). A symmetric slope from linear regression analysis and a strong correlation coefficient show a high degree of equivalence between the sets of data (*Appendix E*).

BOD_5

BOD composite influent comparisons were somewhat more divergent (*Table 2*). Chelan's results are generally lower than Ecology's results.

Table 1 – General Chemistry Results – Chelan STP, 1992

Parameter I	Location:	Inf-1	Inf-2	Inf-E	Inf-C	Pri-Ef-1	Pri-Ef-2	Pri-Ef-E	RBC-Inf-1	RBC-Inf-2	RBC-Inf-E	Ef-1	Ef-2
	Type:	grab	grab	E-comp	C-comp	grab	grab	E-comp	grab	grab	E-comp	grab	grab
	Date:	7/28	7/28	7/28-29	7/28-29	7/28	7/28	7/28-29	7/28	7/28	7/28-29	7/28	7/28
	Time:	0915	1630	@	@	0955	1645	@	1030	1425	@	1050	1550
	Lab Log #:	318080	318081	318082	318083	318084	318085	318086	318087	318088	318089	318090	318091
GENERAL CHEMISTRY													
Conductivity (umhos/cm)		459	469	408	454	432	439	411	386	410	386	321	342
Alkalinity (mg/L CaCO3)				150	171			145			139		
Hardness (mg/L CaCO3)				54.7	54.7			48.7			49.7		
SOLIDS													
TS (mg/L)				440	570			313			369		
TNVS (mg/L)				9	125			122			127		
TSS (mg/L)		176 B	225 B	167 B	367 B	75 B	83 B	117 B	116 B	127 B	142 B	22 B	21 B
TNVSS (mg/L)				19	50			22			21		
% Solids													
% Volatile Solids													
OXYGEN DEMAND PARAMETERS													
BOD5 (mg/L)				132	195			162			147		
BOD5-Dissolved (mg/L)				54	72			105			75		
BOD INH (mg/L)				117	165			147			126		
COD (mg/L)		390	353	368	432	302	340	362	309	306	300	80.8	78.6
TOC (water mg/L)		39.6	49.2	45.1	57.3	54.1	58.3	57.5	37.3	45.65	36.8	20.9	17.1
TOC (soil mg/Kg dry wt.)													
NUTRIENTS													
Total Persulfate N(TPN) (mg/L)				19.5	17.9			16.7			22.2		
NH3-N (mg/L)				20.2	23.2			20.9			19.2	6.55	10.6
NO2+NO3-N (mg/L)				<0.01	<0.01			<0.01			0.027	6.02	5.44
Total-P (mg/L)				4.88	5.44			4.82			4.91	4.31	3.91
MISCELLANEOUS													
Oil and Grease (mg/L)		36.9	50			32.3	33.6					6.17	3
F-Coliform MF (#/100mL)													
Fecal Coliform (sed #/100ml)													
Total Coliform (sed #/100ml)													
FIELD OBSERVATIONS													
Temperature (C)		24	24.2		24.7	23.7	24.2		24.4	25.2		25.1	27.1
Temp-cooled (C)				9.1				5.9			2.9		
pH		7.3	7.16	7.48	6.93	6.93	7.16	6.88	6.64	6.5	7.28	6.72	7
Chlorine (Total mg/L)			<0.1				<0.1		<0.1	<0.1		<0.1	0.5

E Ecology Sample
C Chelan Sample
@ Composite sampling time: 08:00-08:00
comp Composite sample
grab Grab sample
gr-comp Grab-Composite sample

Inf Influent
Ef Effluent
Pri Primary Clarifier
RBC Rotating Biological Contactor

B Procedural blanks showed significant levels of analyte.
U Analyte was not detected at or above the reported estimate.

Table 1 – General Chemistry Results – Chelan STP, 1992

Parameter II	Location:	EF-3	Ef-4	Ef-GC	Ef-E	Ef-C	Sludge-1	Sludge-2	River-1	River-2	Duplicate
	Type:	grab	grab	E-gr/cmp	E-comp	C-comp	grab	grab	grab	grab	E-comp
	Date:	7/29	7/29	7/28	7/28-29	7/28-29	7/28	7/29	7/29	7/29	7/28-29
	Time:	0915	1205	AM&PM	@	@	0940	1055	1240	1300	@
	Lab Log #:	318092	318093	318094	318095	318096	318101	318102	318103	318104	318130
GENERAL CHEMISTRY											
Conductivity (umhos/cm)				328	344	335			131	130	411
Alkalinity (mg/L CaCO3)				75.9	77.8	78.8	5030	581			147
Hardness (mg/L CaCO3)				51.2	51.7	50.2			62.6	64.1	51.2
SOLIDS											
TS (mg/L)					205	219					345
TNVS (mg/L)					118	105					133
TSS (mg/L)				22 B	23 B	22 B					114 B
TNVSS (mg/L)					1 U	2					14
% Solids							3.8	1.3			
% Volatile Solids							2.4	0.8			
OXYGEN DEMAND PARAMETERS											
BOD5 (mg/L)					26	20					195
BOD5-Dissolved (mg/L)					16	6					102
BOD INH (mg/L)					24	16					165
COD (mg/L)					78.6	84.5			<20	<20	339
TOC (water mg/L)					18.1	16.2			2.85	1.96	50.9
TOC (soil mg/Kg dry wt.)							2650*	234000*			
NUTRIENTS											
Total Persulfate N(TPN) (mg/L)					8.86	8.53	1480	408			11.7
NH3-N (mg/L)					8.86	8.47			0.384	0.21	20.7
NO2+NO3-N (mg/L)					5.82	5.75			0.024	0.022	<0.01
Total-P (mg/L)					3.88	3.81			0.047	0.044	0.509
MISCELLANEOUS											
Oil and Grease (mg/L)											
F-Coliform MF (#/100mL)		180000	330000								
Fecal Coliform (sed #/100ml)								>1600000			
Total Coliform (sed #/100ml)								>1600000			
FIELD OBSERVATIONS											
Temperature (C)							31		19.3	19.7	
Temp-cooled (C)					3.1	17.8					5.9
pH					7.52	7.59	7.32		7.94	7.94	6.88
Chlorine (mg/L)		<0.1	<0.1								

E	Ecology Sample	Pri	Primary Clarifier	River	River sample
C	Chelan Sample	RBC	Rotating Biological Contactor	Duplicate	Replication of Pri-Ef-E analysis
@	Composite sampling time: 08:00-08:00	B	Procedural blanks showed significant	Sludge	Sludge sample
comp	Composite sample		levels of analyte.	Inf	Influent
grab	Grab sample	U	Analyte was not detected at or above	Ef	Effluent
gr-comp	Grab-Composite sample		the reported estimate.	*	Differences in TOC between sludge samples are not typical.

Table 2 – Split Sample Results – Chelan STP, 1992.

Parameter	Location:	Inf-E	Inf-C	EF-3	Ef-4	Ef-E	Ef-C
	Type:	E-Comp	C-Comp	grab	grab	E-Comp	C-Comp
	Date:	7/28-29	7/28-29	7/29	7/29	7/28-29	7/28-29
	Time:	@	@	0915	1205	@	@
	Lab Log #:	318082	318083	318092	318093	318095	318096
SOLIDS							
TSS (mg/L)							
	Ecology Analysis	167 B	367 B			23 B	22 B
	Chelan Analysis	155	334			26	19
OXYGEN PARAMETERS							
BOD5 (mg/L)							
	Ecology Analysis	132	195			26	20
	Chelan Analysis	130	137			24	25
MISCELLANEOUS							
F-Coliform MF (#/100mL)							
	Ecology Analysis			180000	330000		
	Chelan Analysis			>120000	>120000		

Inf	Influent into the primary clarifier.	E	Ecology sample.
RBC	Influent into the Rotating Biological Contactor.	C	Chelan sample.
EF	STP effluent.	Comp	Composit Sample – 24 hour period.
Pri	Primary Clarifier	grab	Grab sample.
@	Composite sampling time: 08:00–08:00.	B	Procedural blanks showed significant levels of analyte.

Fecal Coliform

The dilution factor needed due to the high counts in the effluent exceeded the dilution factor used by Chelan. This prevented direct comparison of Ecology and Chelan results. Both labs detected high counts of fecal coliform (*Table 2*). Laboratory accreditation for this test would be useful and it is recommended that Chelan obtain accreditation.

Composite Sample Collection

Laboratory results for the Ecology and Chelan effluent composite samples were very similar (*Table 2*). Both composite and grab data suggest the Ecology and Chelan effluent samples were representative.

Differences were apparent in the Ecology and Chelan influent samples. Both laboratories found the TSS concentration in the Chelan sample to be more than twice the concentration in the Ecology sample (*Table 2*). Ecology found a higher BOD_5 in the Chelan sample (195 mg/L) than in the Ecology sample (132 mg/L). Ecology also found higher COD and TOC concentrations in the Chelan sample (*Table 1*). Chelan found a similar BOD_5 concentration in both samples (130 mg/L and 137 mg/L). Nutrient concentrations were similar in both samples. Ecology influent grab sample results for TSS, COD, and TOC were more similar to Ecology composite sample composition than to Chelan composite sample composition (*Table 1*). The Chelan influent composite sampler and sampler intake should be inspected to assure representative samples are being collected.

Effluent NPDES Permit Comparisons

Table 3 compares the results of the inspection to NPDES permit limits. Effluent concentrations were generally less than weekly and monthly permit limits. The maximum effluent discharge of BOD_5 (258 lbs/day) was just within the NPDES monthly average effluent limitations (*Table 3*). A BOD_5 reduction of 80% as calculated with data from Ecology's composite samples was less than the removal efficiency of 85% required by permit. The reduction calculated with Chelan's composite sample data was 90%. Although measurements of other oxygen demand parameters indicate that the plant effectiveness was more or less adequate, there is room for improvement. TSS effluent discharge (228 lbs/day) was within the NPDES monthly average effluent limitation and well within the weekly average limitation.

Based on measurements of effluent flow rates, the Chelan STP exceeded the monthly average NPDES effluent flow limit of 1.1 MGD. Monthly average flows from previous years suggest that during the summer recreational months the Chelan STP regularly exceeds permit effluent flow limits. This appears to be a chronic seasonal violation of permit limits and may require modification to plant capacity.

Table 3 – NPDES Limits/Inspection Results – Chelan STP, 1992.

Parameter	NPDES Permit Limits		Inspection Data										
				Ecology Composite		Chelan Composite		Grab Samples					
			Location:	Inf-E	Ef-E	Inf-C	Ef-C	Inf-1	Ef-1	Inf-2	Ef-2	Ef-3	Ef-4
			Type:	E-comp	E-comp	C-comp	C-comp	grab	grab	grab	grab	grab	grab
			Date:	7/28-29	7/28-29	7/28-29	7/28-29	7/28	7/28	7/28	7/28	7/28	7/28
	Monthly Average	Weekly Average	Time:	@	@	@	@	0915	1050	1630	1550	0915	1205
			Lab #:	318082	318095	318083	318096	318080	318090	318081	318091	318092	318093
Effluent BOD5													
(mg/L)	30	45			26		20						
(lbs/Day)	275	400			258		198						
(% removal)	85	-------			80		90						
Influent BOD5													
(mg/L)		-------		132		195							
(lbs/Day)	2100 △	-------		1310		1940							
Effluent TSS													
(mg/L)	30	45			23 B		22 B		22 B		21 B		
(lbs/Day)	275	400			228		218						
(% removal)	85	-------			86		94						
Influent TSS													
(mg/L)		-------		167 B		367 B		176 B		225 B			
(lbs/Day)	1850 △	-------		1660		3640		1530		1950			
Fecal coliform													
(colonies/100 mL)	200	400										180000	330000
pH													
(S.U.)	---- 6.0 < pH < 9.0 ----				7.52		7.59		6.72		7		
Effluent Flow													
(MGD)	1.10	-------			1.19 *		1.19 *						
Influent Flow													
(MGD)													
Average	1.10 △	-------		1.04 *		1.04 *			1.04 *		1.04 *		
Peak	2.42 △	-------											

E Ecology sample
C Chelan sample
Ef Effluent
Inf Influent
comp Composite sample
grab Grab sample
@ Composite sampling period: 08:00 – 08:00.
B Analyte was also found in the analytical method blank indicating that the sample may have been contaminated.

* Chelan flowmeter data
△ Design criteria

The effluent fecal coliform count exceeded NPDES permit limits. Grab sample analysis produced a count of 180,000 colonies/100 mL for one sample and a count of 330,000 colonies/100 mL for another. The geometric mean (244,000 colonies/100 mL) was far in excess of the NPDES monthly and the weekly average limitations of 200 colonies/100 mL and 400 colonies/100 mL respectively (*Table 3*). This high fecal coliform count could be attributed to inadequate chlorine residual in the chlorine contact chamber.

Total chlorine residuals (TCRs) in the effluent were less than 0.1 mg/L for all grabs except one. This exception, which produced a value of 0.5 mg/L could reflect fluctuations in flow. Low effluent chlorine residual in the absence of a dechlorination process indicates inadequate chlorine addition during periods of high flow. The operator of the Chelan facility related that the present flow proportional chlorine injection system had inadequate capacity to produce acceptable concentrations of chlorine in the contact chamber during summer flows. He explained that during the summer recreational season he deactivates the automatic system and then adjusts concentrations manually to achieve appropriate levels. At an estimated 35 lbs/day of liquid chlorine and an average flow rate of 1.19 MGD, his additions produced an initial TRC concentration in the effluent of 3.53 mg/L. Compared to a minimum 15 minute chlorine demand for typical secondary effluent of 4 mg/L this concentration was inadequate for effective chlorination (White, 1986). It is assumed that initial TRC concentrations would be considerably less during peak flow situations.

Judging by the high fecal coliform levels, the operator's efforts at manual chlorination have been ineffective, particularly in compensating for the rapid fluctuations of plant flow. Adequate chlorine residual for effective disinfection was not maintained as required by the NPDES permit narrative limitation for chlorine residual. Improvements to the disinfection system are needed. These improvements should ensure adequate chlorine residuals despite rapid variations in flow.

Influent NPDES Permit Comparisons

The Chelan influent flow rates approached the NPDES monthly average hydraulic design capacity of 1.1 MGD (*Table 3*) . The flow was still well within the peak monthly average flow allowance of 2.42 MGD, although peak flow usually occurs in August. Additional influent flow data provided by the Chelan operator indicates the flow criteria has been regularly approached or exceeded. The average flow for the month of July was 1.08 MGD. This is 98% of the design criteria and exceeds the 85% permit criteria for hydraulic capacity. The permit requires that when flow entering the plant reaches 85% of any design criteria, the permittee is required to submit to the Department of Ecology a plan and schedule for continuing to maintain adequate treatment capacity.

BOD_5 loadings were within design criteria for both the Ecology and Chelan composite samples. The TSS loading was within design criteria for the Ecology sample and exceeded design criteria for the Chelan sample (*Table 3*).

Treatment Efficiency

Treatment efficiencies through the plant are calculated in Table 4. Removal rates calculated with Ecology sample data found 86% TSS removal and 80% BOD_5 removal. Approximately 50% of the NH_3-N was nitrified.

Removal rates calculated with Ecology analysis of the Chelan influent and effluent samples are also included in Table 4. Removals were somewhat higher using Chelan sample data, but as discussed previously, grab sample results suggest the Ecology influent sample was more representative.

Primary Clarifier Performance

Using Ecology sample data, treatment across the primary clarifier appeared to be marginal with a TSS removal efficiency of 30% (*Table 4*). Efficiency averaged 68.1% using the Chelan influent sample data. Typical TSS reduction of 50-70% in well designed primary clarifiers is expected (Metcalf & Eddy, 1991).

Ecology composite samples showed an increase across the primary clarifier of about 25% for total and inhibited BOD_5 (*Table 4*). Dissolved BOD_5 almost doubled. Slight decreases in dissolved BOD_5 were calculated using the Chelan influent sample.

These results represent a relatively short time period (24 hours) and may result from sporadic or periodic conditions found in the primary clarifier during the inspection. Solids removed from and methane production in the anaerobic digester indicates TSS and organic material removal by the primary clarifier.

Visual observations during the inspection also suggested less than optimal clarifier performance. The flow velocity appeared high, and turbulence was observed suggesting possible short-circuiting. A great deal of turbidity was observed in the overflow. For average flow rates, sizing calculations indicate that the primary clarifier falls within typical design criteria for overflow rate, weir loading, and detention time (*Appendix F*). The visual observations are likely related to the wide and rapid variations in influent flow rates. Inspection of the primary clarifier when drained may be useful to assure there are no physical problems in the clarifier.

Rotating Screen/Connecting Pipeline

Data collected through this portion of the plant found a 21% increase in the TSS concentration (Table 4). Oxygen demand parameter concentrations decreased between 9 and 36%. With only one data point at each end of the section of plant, caution is necessary in interpreting the unusual data. Additional samples at the two stations are necessary if an accurate estimation of treatment is to be made for this section of the facility.

Table 4 – General Chemistry Results with Percent Removal – Chelan STP, 1992

I. Ecology Analysis of Ecology Samples

Parameter I / Location: / Type: / Date: / Time: / Lab Log #:	Inf-E E-Comp 7/28-29 @ 318082	Primary Clarifier Percent Removal *	Pri-Ef-E E-Comp 7/28-29 @ 318086	Removal Through Screen & Pipe **	RBC-Inf-E E-Comp 7/28-29 @ 318089	RBC Percent Removal ***	Ef-E E-Comp 7/28-29 @ 318095	Total Percent Removal ****
GENERAL CHEMISTRY								
Conductivity (umhos/cm)	408	-0.7%	411	6.1%	386	10.9%	344	15.7%
Alkalinity (mg/L CaCO3)	150	3.3%	145	4.1%	139	44.0%	77.8	48.1%
Hardness (mg/L CaCO3)	54.7	11.0%	48.7	-2.1%	49.7	-4.0%	51.7	5.5%
SOLIDS								
TSS (mg/L)	167 B	29.9%	117 B	-21.4%	142 B	83.8%	23 B	86.2%
OXYGEN DEMAND PARAMETERS								
BOD5 (mg/L)	132	-22.7%	162	9.3%	147	82.3%	26	80.3%
BOD5-Dissolved (mg/L)	54	-94.4%	105	28.6%	75	78.7%	16	70.4%
BOD INH (mg/L)	117	-25.6%	147	14.3%	126	81.0%	24	79.5%
COD (mg/L)	368	1.6%	362	17.1%	300	73.8%	78.6	78.6%
TOC (water mg/L)	45.1	-27.5%	57.5	36.0%	36.8	50.8%	18.1	59.9%
NUTRIENTS								
Total Persulfate N(TPN) (mg/L)	19.5	14.4%	16.7	-32.9%	22.2	60.1%	8.86	54.6%
NH3-N (mg/L)	20.2	-3.5%	20.9	8.1%	19.2	53.9%	8.86	56.1%
NO2+NO3-N (mg/L)	<0.01	0.0%	<0.01	170.0%	0.027	-21455.6%	5.82	-58100.0%
Total-P (mg/L)	4.88	1.2%	4.82	-1.9%	4.91	21.0%	3.88	20.5%

II. Ecology Analysis of Chelan Influent/Effluent Samples and Ecology Intermediate Samples

Parameter I / Location: / Type: / Date: / Time: / Lab Log #:	Inf-C C-comp 7/28-29 @ 318083	Primary Clarifier Percent Removal *	Pri-Ef-E E-Comp 7/28-29 @ 318086	RBC-Inf-E E-Comp 7/28-29 @ 318089	RBC Percent Removal ***	Ef-C C-comp 7/28-29 @ 318096	Total Percent Removal ****
GENERAL CHEMISTRY							
Conductivity (umhos/cm)	454	9.5%	411	386	13.2%	335	26.2%
Alkalinity (mg/L CaCO3)	171	15.2%	145	139	43.3%	78.8	53.9%
Hardness (mg/L CaCO3)	54.7	11.0%	48.7	49.7	-1.0%	50.2	8.2%
SOLIDS							
TSS (mg/L)	367	68.1%	117	142 B	84.5%	22	94.0%
OXYGEN DEMAND PARAMETERS							
BOD5 (mg/L)	195	16.9%	162	147	86.4%	20	89.7%
BOD5-Dissolved (mg/L)	72	-45.8%	105	75	92.0%	6	91.7%
BOD INH (mg/L)	165	10.9%	147	126	87.3%	16	90.3%
COD (mg/L)	432	16.2%	362	300	71.8%	84.5	80.4%
TOC (water mg/L)	57.3	-0.3%	57.5	36.8	56.0%	16.2	71.7%
NUTRIENTS							
Total Persulfate N(TPN) (mg/L)	17.9	6.7%	16.7	22.2	61.6%	8.53	52.3%
NH3-N (mg/L)	23.2	9.9%	20.9	19.2	55.9%	8.47	63.5%
NO2+NO3-N (mg/L)	0.01	0.0%	<0.01	0.027	-21196.3%	5.75	-58100.0%
Total-P (mg/L)	5.44	11.4%	4.82	4.91	22.4%	3.81	30.0%

E Ecology Sample
C Chelan Sample
@ Composite sampling time: 08:00-08:00
comp Composite sample
* Influent through Primary Clarifier.
** Rotating screen and approximently 5 miles of pipe.
*** Influent to RBC through Effluent.
**** Through entire plant.

Inf Influent sample
Ef Effluent sample
Pri Primary Clarifier
RBC Rotating Biological Contactor
Sludge Sludge Sample

B Procedural blanks showed significant significant levels of analyte.
U Analyte was not detected at or above the reported estimate.

Secondary Plant

The secondary plant was providing the majority of the BOD_5 and TSS removal during the inspection (*Table 4*). Partial nitrification was also occurring. As noted in the flow discussion, more balanced flow distribution to the two RBC trains, and more even distribution along the shafts may improve treatment.

The capacity of each single chlorine contact chamber was calculated to be 27,117 gallons. At the inspection effluent flow of 1.19 MGD, retention times were 33 minutes if one chamber were used or 66 minutes when both chambers were used. At the peak inspection flow of 1.77 MGD, retention times were 22 minutes if one chamber were used or 44 minutes when both chambers were used. These retention times exceed accepted disinfection contact times of 60 minutes for average flows and 20 minutes for peak flows when both contact chambers were in operation (Ecology, 1985).

During the inspection, algae and Sphaerotilus were growing in the secondary clarifier effluent channel. The operator related that he occasionally applied chlorine powder used in swimming pools to control the growth. It was also noticed that concrete of these structures appeared somewhat degraded. It is possible that this structural damage may be due to excessive concentrations of chlorine in the algicide solution. It is suggested that the use of lower concentrations of chlorine be investigated.

Sludge

Percentage solids in anaerobically digested primary sludge was 3.8%. This is less than typical values of 6.0% to 12.0% for total dry solids in digested primary sludge (Metcalf & Eddy, 1991). A likely explanation was the operator's decision not to decant supernatant from the digester. Volatile solids constituted 63% of the total sludge solids. This is above the upper range of 60% typically found in primary digested sludge. A higher percent volatile solid indicates a less efficient digesting process.

The secondary system sludge was 1.3% solids. The value is within the typical range for aerobically digested sludges wasted from activated processes (Metcalf & Eddy, 1991). Fecal and total coliform levels in the secondary sludge sample were greater than 1,600,000 colonies/100 mL (>1,230,000 colonies/g solids). EPA Environmental Regulations and Technology for the Control of Pathogens in Municipal Wastewater Sludge, EPA/625/10-89/006 suggests acceptable pathogen reduction for typical sludge treatment systems. Its criteria defines an acceptable indicator of pathogen reduction for anaerobic and aerobic digesters as an average density (colonies/g TS) of fecal coliform and fecal streptococci of less than 1,000,000 colonies/g solids. The fecal coliform value in secondary sludge exceeded recommendations by about 25% or more.

It should be noted that EPA Pathogen Equivalency Committee (PEC) suggest calculations be based on the average log density of at least nine sludge samples, so the previous result must

be somewhat qualified. Nevertheless, failure to produce good pathogen reduction could indicate a less efficient sludge treatment system. The operation of the secondary digester can be evaluated to further reduce fecal coliform if necessary. The high bacterial count in the secondary sludge should also be evaluated against applicable guidelines and regulations.

Detected Organics and Priority Pollutants

Table 5 summarizes concentrations of organic priority pollutants detected during the inspection. Appendix G contains the results of all targeted organic compounds, including detection limits. Tentatively identified compounds are presented in appendix H.

VOA Compounds

Inspection data revealed several organic compounds in concentrations appreciably above the detection limit (*Table 5*). Detected VOA parameters were compared to the Environmental Protection Agency's acute and chronic water quality criteria for freshwater environments (*Table 5*). Acetone, chloroform, and 1,4-dichlorobenzene were detected in both the influent and effluent. Toluene and bromomethane were detected in the effluent only. None of these concentrations exceeded the EPA water quality criteria for either chronic or acute freshwater environments. The influent concentrations of acetone were up to 100 times the concentrations of other detected VOA contaminates. Although this compound is widely used for laboratory equipment cleaning, high influent concentrations combined with consistent reductions across the STP suggest that the concentration may be real. Also, effluent concentrations exceeded concentrations found in laboratory blanks by at least a factor of 15. No EPA water quality criterion was available for this compound, but concentrations were below the threshold concentrations for acetone identified by the State of California to cause immobilization in aquatic invertebrates and fishes (McKee and Wolf, 1963).

Toluene was detected in the effluent at 23 μg/L. It was also detected in the influent to the RBCs. Although this compound (often associated with gasoline and other petroleum products) was not detected in the influent, this may be due to the timing of the grab samples. It is also possible that it was introduced within the plant somewhere upstream of the RBCs.

P-isopropyltoluene was found in the primary system's sludge in concentrations of 160,000 μg/Kg and is the only sludge VOA concentration that stands out. This compound is rated as moderately toxic and can be produced by the alkylation [$(CH_3)_2CH_3$- addition] of toluene (Sax and Lewis, 1987).

BNA Compounds

Although a number of these compounds were detected in the effluent, only bis(2-ethylhexyl)phthalate was found to exceed EPA water quality criteria *(Table 5)*. This compound was found in the effluent at a concentrations of 7 μg/L which exceeds the EPA

Table 5 – VOA, BNA, and Pesticide/PCB Results – Chelan STP, 1992.

Location:	Inf–1	Inf–2	Inf–E	RBC–Inf–1	RBC–Inf–2	RBC–Inf–E	Ef–1	Ef–2	Ef–E	EPA Water Quality Criteria Summary		Sludge–1	Sludge–2
Type:	grab	grab	E–Comp	grab	grab	E–Comp	grab	grab	E–Comp			grab	grab
Date:	7/28	7/28	7/28–29	7/28	7/28	7/28–29	7/28	7/28	7/28–29	Acute Fresh	Chronic Fresh	7/28	7/29
Time:	0915	1630	@	1030	1425	@	1050	1550	@			0940	1055
Lab Log#:	318080	318081	318082	318087	318088	318089	318090	318091	318095			318101	318102
VOA Compounds	µg/L	µg/L		µg/L	µg/L		µg/L	µg/L		(µg/L)	(µg/L)	µg/Kg	µg/Kg
Acetone	83	260		90	110		15	19				670 J	– –
Chloroform	3	3		1	3		0.5 J	0.9 J		28,900 *	1,240 *	– –	– –
Benzene	– –	– –		– –	– –		– –	– –		5,300 *		– –	21 J
Bromomethane	– –	– –		– –	– –		0.3 J	– –		11,000 *(a)		– –	– –
Methylene Chloride	– –	– –		– –	– –		– –	– –		11,000 *(a)		32 J	– –
Carbon Disulfide	– –	– –		– –	– –		– –	– –				200 J	29 J
2–Butanone (MEK)	– –	3 J		3 J	4 J		4 J	2 J				170 J	260 J
Naphthalene	– –	– –		– –	– –		– –	– –		2,300 *	620 *	1300 J	– –
2–Chlorotoluene	– –	– –		– –	– –		– –	– –				520 J	– –
1,2–Dichlorobenzene	– –	– –		– –	– –		– –	– –		1,120 *(h)	763 *(h)	130 J	– –
1,2,4–Trimethylbenzene	– –	– –		– –	– –		– –	– –				1400 J	– –
Isopropylbenzene	– –	– –		– –	– –		– –	– –				59 J	– –
p–Isopropyltoluene	7	3		40	– –		– –	– –				160000	– –
Ethylbenzene	– –	– –		– –	– –		– –	– –		32,000 *		74 J	– –
Propylbenzene	– –	– –		– –	– –		– –	– –				160 J	– –
1,4–Dichlorobenzene	2	2		1	– –		0.5 J	– –		1,120 *(h)	763 *(h)	1200 J	– –
4–Methyl–2–Penta (IBK)	– –	– –		– –	– –		– –	– –				54	– –
1,3,5–Trimethylbenzene	– –	– –		– –	– –		– –	– –				570 J	6 J
Toluene	– –	– –		30	22		23	7		17,500 *		9000	5400
Chlorobenzene	– –	– –		– –	– –		– –	– –		250 *(g)	50 *(g)	116 J	9 J
Tetrachloroethene	– –	0.3 J		– –	– –		– –	– –		5,280 *	840 *	8 J	– –
1,3–Dichlorobenzene	– –	– –		– –	– –		– –	– –		1,120 *(h)	763 *(h)	95 J	– –
Total Xylenes	– –	– –		– –	– –		– –	– –				490 J	– –
BNA Compounds			ug/L			µg/L			ug/L	(µg/L)	(µg/L)	ug/Kg	ug/Kg
Benzo(a)Pyrene			– –			– –			– –			1700 J	– –
Benzo(a)Anthracene			–			– –			– –			6300	– –
Benzoic Acid			– –			– –			0.9 J			– –	– –
Isophorone			– –			– –			– –	117,000 *		2400 J	730 J
Diethyl Phthalate			8			6 J			0.5 J	940 *(i)	3 *(i)	– –	– –
Di–n–Butyl Phthalate			– –			– –			0.1 J	940 *(i)	3 *(i)	– –	– –
Phenanthrene			0.4 J			0.3 J			0.09 J			3900	– –
Butylbenzyl Phthalate			3 J			– –			0.2 J	940 *(i)	3 *(i)	19000	– –
Fluorene			– –			– –			0.04 J			– –	– –
1–Methylnaphthalene			– –			– –			0.08 J			1700 J	– –
Nitrobenzene			– –			– –			0.08 J	27,000 *		– –	– –
Benzyl Alcohol			20 J			14 J			– –			– –	– –
4–Methylphenol			0.5 J			8			28			– –	2000 J
1,4–Dichlorobenzene			1 J			– –			0.2 J	1,120 *(h)	763 *(h)	1500 J	– –
Phenol			– –			– –			2	10,200 *	2,560 *	– –	– –
Bis(2–Ethylhexyl)Phthalate			38			32			7	940 *(i)	3 *(i)	190000	200000
Di–n–Octyl Phthalate			3 J			2 J			0.3 J	940 *(i)	3 *(i)	7300 J	– –
Pyrene			– –			– –			– –			5800	1800 J
Benzo(b)Fluoranthene			– –			– –			– –			– –	1300 J
Fluoranthene			– –			– –			– –	3,980 *		5700	1300 J
Benzo(k)Fluoranthene			– –			– –			– –			5800	– –
Chrysene			– –			– –			– –			3400 J	– –

J The analyte was positively identified. The associated numerical value is an estimate.
@ Composite sample times: 0800–0800
Sludge Sludge sample

Inf Influent sample
RBC Rotating Biological Contactor
E Ecology sample
grab grab sample
comp composite sample

a Total Halomethanes
g Total Chlorinated Benzenes (excluding Dichlorobenzenes)
h Total Dichlorobenzenes
i Total Chloroalkyl Ethers
– Not detected

chronic freshwater criteria of 3 μg/L. Influent concentration of 38 μg/L and sludge concentrations of 190 to 200 mg/Kg suggests a continuous source.

In the primary sludge benzo(a)pyrene has a dry weight concentration of 1.7 mg/Kg. The EPA National Sewage Sludge Survey (EPA, 1990) provides geometric mean (0.22 mg/Kg) and the mean plus one standard deviation (0.62 mg/Kg) for this compound (*Table 6*). Data was limited to three samples where benzo(a)pyrene was detected out of 70 sludges tested. The Chelan sludge dry weight concentration for this compound was about three times the positive standard deviation. Bis(2-ethylhexyl)phthalate was found in the primary sludge at dry weight concentrations of 190 mg/Kg and in the secondary sludge at dry weight concentrations of about 200 mg/Kg. The EPA National Sewage Sludge Survey reported a geometric mean concentration of 74.7 mg/Kg and a concentration at one positive standard deviation of 747 mg/Kg (*Table 6*). The Chelan sludge dry weight concentrations for these two samples exceeded the geometric mean, but were well within one positive standard deviation.

Pesticides/PCB Compounds

None of these compounds were detected in any matrix.

Metals

Metals were found at levels in the STP's effluent that exceeded the EPA's water quality criteria for receiving waters (*Table 7*). Copper and silver were found in the effluent at concentrations of 19 μg/L and 2.4 μg/L, respectively. These levels exceeded both the acute and chronic EPA freshwater quality criteria for receiving waters. Effluent concentrations of lead (2.1 μg/L) and mercury (0.065 μg/L) exceeded the EPA chronic freshwater criteria. All other metal effluent concentrations were within EPA criteria. Evaluation of the impact that these concentrations may have within the dilution zone seems desirable.

Dry weight concentrations of metals in the primary sludge were all less than geometric means found in the EPA National Sludge Sewage Survey. In the secondary sludge only Arsenic (72.2 mg/Kg-dry) exceeded the survey's mean plus one positive standard deviation (28.7 mg/Kg-dry). Evaluation of this concentration with regard to applicable sludge regulations is advised.

Bioassays

96-Hour Rainbow Trout Toxicity Test

The laboratory observed 100% survival rates implying no acute toxicity at 100% effluent concentration (*Table 8*).

Table 6 – Comparison of Detected Compounds in Digested Sludge with the National Sewage Sludge Survey – Chelan, 1992

Parameter	Location: Type: Lab Log #	Sludge-1 grab 318101	Sludge-2 grab 318102	Data from EPA Sludge Survey (EPA, 1990)* Geometric Mean **	Geometric Mean + 1 S.D.	Number of Samples	Percent Detected
		(mg/Kg) dry wt.	(mg/Kg) dry wt.	(mg/Kg) dry wt.	(mg/Kg) dry wt.		(%)
VOA COMPOUNDS							
Benzene		– –	0.021 J	0.0005 ##	0.025 ##	87 ##	4 ##
BNA COMPOUNDS							
Benzo(A)pyrene		1.7 J	– –	0.22 ++	0.62 ++	70 ++	3 ++
Bis(2-ethylhexyl) Phthalate		190	200	74.7	673	200	62
Pesticide/PCB COMPOUNDS							
(No Pesticides/PCBs Detected)							
METALS							
Arsenic		7.6	72.2	9.93	28.7	199	80
Cadmium		3.84	4.5 P	6.9	18.7	198	69
Chromium		11.8	10.8	119	458	199	91
Copper		416	546	741	1700	199	100
Lead		120	130	134	332	199	80
Mercury		4 N	2.3 PNB	5.22	20.8	199	63
Nickel		11.3	12.3 PNB	42.7	138	199	66
Selenium		2 N	2.53	5.16	12.5	199	65
Zinc		1140	1190	1200	2760	199	100

* Geometric mean and variance are exponential conversions of arithmetic mean and variance for log–normal distributions and were derived utilizing the Method of Maximum Likelihood.

J Result is an estimate.

** In general, concentrations are a weighted combination of flow rate group estimates.

Weighted combination of only two flow groups: flow ≥ 100 MGD and 10 < flow < +100 MGD.

++ Estimate from one flow group: 1<flow<10

B Procedural blanks showed significant levels of the analyte.

N For metals the spike sample recovery is not within control limits.

P The analyte was detected above the instrument detection limits, but below the established minimum qualification limit.

Table 7 – Detected Metals Results – Chelan, 1992.

Location:	Inf-E	RBC-Inf-E	Ef-E	River-1	River-2	EPA Water Quality Criteria Summary		Sludge-1	Sludge-2
Type:	E-Comp	E-Comp	E-Comp	grab	grab			grab	grab
Date:	7/28-29	7/28-29	7/28-29	7/29	7/29	Acute Fresh	Chronic Fresh	7/28	7/29
Time:	@	@	@	1240	1300			0940	1055
Lab Log#:	318082	318089	318095	318103	318104			318101	318102
Metals Hardness 60	ug/L	ug/L	ug/L	ug/L	ug/L	(µg/L)	(µg/L)	mg/Kg (Dry wt.)	mg/Kg (Dry wt.)
Arsenic (total)	2.2 P	2.1 P	1.6 P	--	--	**	**	7.6	72.2
Pentavalent						850 *	48 *		
Trivalent						360	190		
Cadmium	0.56 B	0.58 B	0.26 PB	0.17 PB	0.73 B	2.2 +	0.8 +	3.8	4.5 P
Chromium (total)	--	--	--	--	--	**	**	11.8	10.8
Hexavalent						16	11		
Trivalent						1,143 +	136 +		
Copper	54.4	42.2	19	--	--	11 +	8 +	416	546
Lead	3 P	4 P	2.1 P	--	--	43 +	1.7 +	120	133
Mercury	0.094 PNB	0.063 PNB	0.065 PNB	--	--	2.4	0.012	4 N	2.3 PNB
Nickel	--	--	--	--	--	921 +	102 +	11.3	12.3 PNB
Selenium	--	--	--	--	--	260	35	2 N	2.5 N
Silver	5.01	4.7	2.4	--	--	1.7 +	0.12	--	--
Zinc	93.9	85.8	41.7	9.5 P	6.1 P	76 +	69 +	1140	1190

B Procedural blanks showed significant levels of analyte.
N For metals the spike sample recovery is not within control limits.
P The analyte was detected above the instrument detaction limits, but below the established minimum qualification limit.
@ Composite sample times: 0800-0800

Ef Effluent sample
Sludge Sludge sample
E Ecology sample
grab grab sample
comp composite sample
River River sample
-- Not detected

\+ Hardness dependent criteria (60 mg/L used).
i Total Phthalate Esters
a Total Halomethanes
h Total Dichlorobenzenes
* Insufficient data to develop criteria. Value presented value presented as LOEL – Lowest Observable Effect Level.
** Values can represent concentrations of two or more valance forms, thus if it is within the max and min the meeting of criteria cannot be assumed.

Table 8 – Effluent Bioassay Results – Chelan, 1992.

NOTE: all tests were run on the effluent (Ef-GC sample) – lab log # 318094

Ceriodaphnia dubia – 10 day survival and reproduction test

(Ceriodaphnia dubia)

Sample	# Tested	Percent Survival	Mean # Young per Original Female
Control	10	80	11.1
6.25 % Effluent	10	20	29.5
12.5 % Effluent	10	100	24.8
25 % Effluent	10	100	27.3
50 % Effluent	10	100	24.7
100 % Effluent	10	90	17.9

Survival
LC50 = 100 % effluent
NOEC = 100 % effluent
LOEC = 100 % effluent

Reproduction
NOEC = 100 % effluent

Fathead Minnow – 7 day survival and growth test

(Pimephales promelas)

Sample	# Tested *	Percent Survival	Final Mean Individual Biomass (mg)
Control	35	94.3	0.87
6.25 % Effluent	35	94.3	0.93
12.5 % Effluent	35	100.0	0.92
25 % Effluent	35	100.0	0.84
50 % Effluent	35	97.1	0.84
100 % Effluent	35	100.0	0.61

Survival
LOEC = >100 % effluent
LC50 = >100 % effluent

Growth
NOEC = 50 % effluent
LOEC = 100 % effluent

* five replicates of 7 organisms

Rainbow Trout – 96 hour survival test

(Oncorhynchus mykiss)

Sample	# Tested	Percent Survival
Control	30	100
100% Effluent	30	100

Microtox

	EC50 (% effluent)
5 minutes	*
15 minutes	*
15 minutes**	*

* large number of negative statistical gammas interpreted as indicating low toxicity. Highest effluent concentration tested was 45.5%.

** color corrected

NOEC – no observable effects concentration
LOEC – lowest observable effects concentration
LC50 – lethal concentration for 50% of the organisms
EC50 – effect concentration for 50% of the organisms

7-day Fathead Minnow Survival and Growth Test

Survival of fathead minnows at all test concentrations equaled or exceeded that for the control, indicating no acute toxicity (*Table 8*). The final mean individual biomass test did show a decrease as a function of increased effluent concentration. The growth test produced a chronic No Observable Effects Concentration (NOEC) of 50% and a chronic Lowest Observable Effects Concentration (LOEC) of 100%.

10-Day *Ceriodaphnia dubia* Survival and Reproduction Test

Ceriodaphnia survival in all test effluent concentrations but one exceeded the control. This strongly suggests a lack of acute toxicity in the effluent (*Table 8*). LC_{50}, NOEC, and LOEC for acute toxicity all exceeded 100%. Reproduction rates exceeded the control at all effluent concentrations. Statistically, this leads to an NOEC of 100% for chronic toxicity.

Microtox

Microtox data displayed random low-level and negative gammas that were indistinguishable from background noise, at both five- and 15-minute readings (*Table 8*). A genuine toxic effect would produce increasing positive gammas representing decrease in bioluminescence with increasing concentration. The results are interpreted as a lack of acute toxicity.

CONCLUSIONS AND RECOMMENDATIONS

Flow Measurements

Rapid fluctuations in flow rates were observed. The fluctuations could affect plant performance. Their impact should be evaluated. The effluent flow measurement device appeared to be slightly under-reporting flows when compared to Ecology flow measurements at the Parshall flume. An overflow bypass allows a portion of peak flows to avoid the effluent meter altogether. It is recommended:

- A schedule for regular flow calibration should be adopted and followed.

- To avoid overflow bypass of the present effluent meter, a new meter should be installed at the Parshall flume located prior to the chlorine contact chamber, if the modifications to the headworks does not eliminate the problem.

Turbulence near the influent flume was of concern, but the problem should be eliminated when the headworks improvements are completed. Flow data found the influent flow to be slightly less than the effluent flow. Comparison of influent and effluent flows after both meters have been calibrated is recommended to determine if further evaluation is necessary.

Inspection results showed an unequal distribution of wastewater flow into the two RBC trains. Unequal distribution of flow along the RBC shafts also appears likely.

- The operator should work to improve the uniformity of distribution of flows between the two trains and along the length of the shafts.

General Chemistry

During the inspection the STP achieved generally adequate reductions in solids and oxygen demand parameters. Reductions in NH_3-N and concurrent increases in NO_2+NO_3-N provide good evidence of partial nitrification in the secondary system.

NPDES Comparisons

Effluent concentrations recorded during the inspection were generally less than weekly and monthly NPDES permit limits. Ecology samples found the BOD_5 removal rate less than 85%. The flow rate slightly exceeded monthly average permit limits.

Effluent fecal coliform concentrations exceeded NPDES permit limits by about three orders of magnitude. Associated with this excess were low chlorine residuals. The automated chlorine injection system was undersized. The manual injection system being used failed to provide adequate chlorinate, particularly during peak/surging flow situations. Partial nitrification in the plant may be contributing to the problem.

- For the long-term Chelan should consider either an upgrade of the present chlorine injection system to achieve greater capacity, or an equalization of the large, rapid fluctuations in plant flow which might allow the current system to operate more efficiently.

- In the interim the operator should enact operational changes in chlorine monitoring and manual injection to achieve required chlorine levels during peak flows.

During the inspection the effluent flow rate exceeded the NPDES monthly average effluent limits. The flow problem is seasonal. Plant flow exceeded 85% of the permit design capacity. Flow data provided by Chelan for the month of July revealed that average monthly influent flow also exceeded the 85% criterion. In accordance with permit requirements Chelan has submitted a plan and a schedule to the Department of Ecology outlining the continuing maintenance of adequate treatment capacity.

Treatment Unit Efficiencies

The primary clarifier appears to be operating with only marginal efficiency. Inappropriate flow patterns through the clarifier were observed. Calculations determined that the clarifier

dimensions were within typical design criteria for the influent flow volumes encountered. Visual observations may be related to the wide and rapid fluctuations in influent flow rates. Most treatment occurred in the secondary plant. Recommendations include:

- An inspection of the primary clarifier when drained to ensure there are no physical problems.

- The operator should investigate the possibility of equalizing influent flows to mitigate rapid fluctuations in plant flow.

It is also suggested that the operator reevaluate the concentration of chlorine used as a algicide to prevent damage to the secondary clarifier structure.

Sludge

High volatile solids concentrations in the primary sludge indicate a anaerobic digestion system that is less efficient than typical systems. The fecal coliform counts measured in the secondary sludge slightly exceeded concentrations recommended by the EPA. These fecal coliform should be compared to any applicable guidelines and/or regulations.

Priority Pollutants and Organics - VOA, BNA, and Pesticide/PCB Scan

Inspection results revealed no VOA's in the effluent at concentrations that exceeded the EPA acute and chronic water quality criteria. Acetone was detected in appreciable amounts, but water quality criteria for this compound was not available. Acetone concentrations were less than what has been previously identified as producing toxic effects for this compound and may have been, at least in part, due to bottle or laboratory contamination.

Toluene was detected in the plant effluent and in the influent to the RBCs. Its absence from the influent may be due to the timing of sampling. In-plant introduction upstream of the RBCs is also a possibility. A possible reaction product of toluene, P-isopropyltoluene was found in considerable quantities in the primary treatment plant sludge. The possibility of a toluene source within the STP should be investigated.

Bis(2-ethylhexeyl)phthalate was the only BNA compound found in concentrations exceeding the EPA chronic water quality criteria for receiving waters. The EPA acute water quality criteria was not exceeded.

Benzo(a)pyrene was found in the primary sludge in concentrations exceeding one standard deviation from the mean of limited data for sewage treatment plants nationwide as established by the EPA National Sewage Sludge Survey. It is recommended that concentrations be compared to any applicable guidelines or regulations.

Priority Pollutant Metals

Copper and silver concentrations exceeded both acute and chronic EPA water quality criteria for receiving waters. Lead and mercury exceeded the chronic EPA water quality criteria for receiving waters. Evaluation of their toxic effects in the receiving water dilution zone is recommended. Higher than average concentrations of arsenic were also found in the secondary sludge.

Bioassays

All bioassays results indicate that no acute toxicity existed in the effluent. The fathead minnow bioassay showed evidence of a slight chronic toxic effect.

Split Sample Results

Parameters analyzed from split samples showed good consistency between Ecology's and Chelan's results. Laboratory accreditation is required by July 1, 1994.

Laboratory results for the Ecology and Chelan effluent composite samples were very similar. Differences were apparent in the Ecology and Chelan influent samples. Ecology influent grab sample results for TSS, COD, and TOC were more similar to Ecology composite sample composition than to Chelan composite sample composition.

- The Chelan influent composite sampler and sampler intake should be inspected to assure representative samples are being collected.

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APPENDICES

Appendix A - Sampling Stations Descriptions - Chelan STP, 1992

INF	Influent at the headworks - Ecology grab collected from the west side of the degritting basin.
Inf-E & Inf-C	Influent at the headworks - Ecology and Chelan composite collected on the north side of the degritting basin.
Pri-Ef & Pri-Ef-E	Effluent from the primary clarifier - Ecology grab and composite samples collected at the overflow from the weir in the outlet channel.
RBC-Inf & RBC-Inf-E	Influent to Rotating Biological contactor - Ecology grab and composite samples collected from the RBC inlet splitter box.
EF, Ef-E, & Ef-C	Effluent from the chlorine contact chamber - Ecology grab and composite samples collected at the outlet end of the chlorine contact chamber.
Ef-GC	Effluent from the chlorine contact chamber - Ecology grab-composite collected in equal volumes approximately eight hours apart from the end of the chlorine contact chamber.
Sludge-1	Anaerobic sludge sample from the primary plant - Ecology sample collected from the tanker truck feed line.
Sludge-2	Aerobic sludge sample from the secondary plant - Ecology sample collected from the feed line to the drying beds.
River-1	Sample collected from the Columbia River across the river from the secondary treatment plant on the east bank. Sample was collected from area with good flow..
River-2	Sample collected from the Columbia River upstream from the secondary treatment plant on the west bank by approximately 2 miles.

Appendix B – Sampling Schedule and Parameter Analysis – Chelan STP, 1992.

Parameter I	Location:	Inf–1	Inf–2	Inf–E	Inf–C	Pri–Ef–1	Pri–Ef–2	Pri–Ef–E	RBC–Inf–1	RBC–Inf–2	RBC–Inf–E
	Type:	grab	grab	E–Comp	C–Comp	grab	grab	E–Comp	grab	grab	E–Comp
	Date:	7/28	7/28	7/28–29	7/28–29	7/28	7/28	7/28–29	7/28	7/28	7/28–29
	Time:	0915	1630	@	@	0955	1645	@	1030	1425	@
	Lab Log #:	318080	318081	318082	318083	318084	318085	318086	318087	318088	318089
GENERAL CHEMISTRY											
Conductivity		E	E	E	E	E	E	E	E	E	E
Alkalinity				E	E			E			E
Hardness				E	E			E			E
SOLIDS											
TS				E	E			E			E
TNVS				E	E			E			E
TSS		E	E	EC	EC	E	E	E	E	E	EC
TNVSS				E	E			E			E
% Solids											
% Volatile Solids											
OXYGEN PARAMETERS											
BOD5				EC	EC			E			
BOD5–Dissolved				E	E			E			
BOD INH				E	E						
COD		E	E	E	E	E	E	E	E	E	E
TOC (water)		E	E	E	E	E	E	E	E	E	E
TOC (soil/sed)											
NUTRIENTS											
Total Persulfate N				E	E			E			E
NH3–N				E	E			E			EC
NO2+NO3–N				E	E			E			E
Total–P				E	E			E			E
MISCELLANEOUS											
Oil and Grease (water)		E	E			E	E				
F–Coliform MF											
F–Coliform (soil/sed)											
T–Coliform (soil/sed)											
ORGANICS											
VOC (water)		E	E						E	E	
VOC (soil/sed)											
BNAs (water)				E							E
BNAs (soil/sed)											
Pest/PCB (water)				E							E
Pest/PCB (soil/sed)											
METALS											
PP Metals (water)				E							E
PP Metals (soil/sed)											
BIOASSAY											
Salmonid (acute 100%)											
Microtox (acute)											
Ceriodaphnia (chronic)											
Fathead Minnow (chronic)											
FIELD OBSERVATIONS											
Temperature		E	E	E	E	E	E	E	E	E	E
pH		E	E	E	E	E	E	E	E	E	E
Conductivity		E	E	E	E	E	E	E	E	E	E
Chlorine		E	E			E	E		E	E	E
Dissolved Oxygen						E	E		E	E	

Inf	Influent into the primary clarifier.	E	Ecology lab analysis.	C–comp	Chelan composite sample
RBC	Influent into the Rotating Biological Contactor.	C	Chelan lab analysis.		
EF	STP effluent.	G/C	Grab Composite – two grabs.		
Pri	Primary Clarifier effluent	grab	Grab sample.		
@	Composite sampling time: 08:00–08:00.	E–comp	Ecology composite sample		

Appendix B – Sampling Schedule and Parameter Analysis – Chelan STP, 1992.

Parameter II	Locatn:	Ef–1	Ef–2	EF–3	Ef–4	Ef–GC	Ef–E	Ef–C	Sludge–1	Sludge–2	River–1	River–2	Duplicate
	Type:	grab	grab	grab	grab	E–gr/cmp	E–Comp	C–Comp	grab	grab	grab	grab	grab
	Date:	7/28	7/28	7/29	7/29	7/28	7/28–29	7/28–29	7/28	7/29	7/29	7/29	7/28–29
	Time:	1050	1550	0915	1205	AM&PM	@	@	0940	1055	1240	1300	@
	Lab Log #:	318090	318091	318092	318093	318094	318095	318096	318101	318102	318103	318104	318130
GENERAL CHEMISTRY													
Conductivity		E	E			E	E	E			E	E	E
Alkalinity						E	E	E					E
Hardness						E	E	E			E	E	E
SOLIDS													
TS							E	E					E
TNVS							E	E					E
TSS		E	E			E	EC	EC					E
TNVSS							E	E					E
% Solids									E	E			
% Volatile Solids									E	E			
OXYGEN PARAMETERS													
BOD5							EC	EC					E
BOD5–Dissolved							E	E					E
BOD INH							E	E					E
COD		E	E				E	E					E
TOC (water)		E	E				E	E					E
TOC (soil/sed)									E	E			
NUTRIENTS													
Total Persulfate N		E	E				E	E	E	E	EC	EC	E
NH3–N		E	E				E	E					E
NO2+NO3–N		E	E				E	E					E
Total–P		E	E				E	E					E
MISCELLANEOUS													
Oil and Grease (water)		E	E										
F–Coliform MF				EC	EC								
F–Coliform (soil/sed)									E	E			
T–Coliform (soil/sed)									E	E			
ORGANICS													
VOC (water)		E	E										
VOC (soil/sed)									E	E			
BNAs (water)							E						
BNAs (soil/sed)									E	E			
Pest/PCB (water)							E						
Pest/PCB (soil/sed)									E	E			
METALS													
PP Metals (water)							E						
PP Metals (soil/sed)									E	E			
BIOASSAY													
Salmonid (acute 100%)						E							
Microtox (acute)						E							
Ceriodaphnia (chronic)						E							
Fathead Minnow (chronic)						E							
FIELD OBSERVATIONS													
Temperature		E	E	E	E	E	E	E	E	E	E	E	E
pH		E	E	E	E	E	E	E	E	E	E	E	E
Conductivity		E	E	E	E	E	E	E	E	E	E	E	E
Chlorine		E	E	E	E	E							
Dissolved Oxygen		E	E										

EF	STP effluent.	E	Ecology lab analysis.	Duplicate	Split from primary clarifier effluent composite.
Sludge–1	Anaerobic digester sludge.	C	Chelan lab analysis.		
Sludge–2	Aerobic digester sludge.	G/C	Grab Composite – two grabs.		
River	Columbia River sample.	Comp	Composit Sample – 24 hour period.		
@	Composite sampling time: 08:00–08:00.	grab	Grab sample.		

Appendix C – Analytical Methods – Chelan STP, 1992

PARAMETER	ANALYTICAL METHOD	LAB USED
GENERAL CHEMISTRY		
Conductivity	EPA, Revised 1983: 120.1	Ecology
Alkalinity	EPA, Revised 1983: 310.1	Ecology
Hardness	EPA, Revised 1983: 130.2	Ecology
SOLIDS 4		
TS	EPA, Revised 1983: 160.3	Ecology
TNVS	EPA, Revised 1983: 160.3	Ecology
TSS	EPA, Revised 1983: 160.2	Ecology
TNVSS	EPA, Revised 1983: 160.2	Ecology
% Solids	APHA, 1989: 2540G.	Ecology
% Volatile Solids	EPA, Revised 1983: 160.4	Ecology
OXYGEN DEMAND PARAMETERS		
BOD5	EPA, Revised 1983: 405.1	Water Management Laboratories, Inc.
BOD5–Dissolved	EPA, Revised 1983: 405.1	Water Management Laboratories, Inc.
BOD INH	EPA, Revised 1983: 405.1	Water Management Laboratories, Inc.
COD	EPA, Revised 1983: 410.1	Analytical Resources Incorportated
TOC (water)	EPA, Revised 1983: 415.1	Analytical Resources Incorportated
TOC (soil/sed)	EPA, Revised 1983: 415.1	Analytical Resources Incorportated
NUTRIENTS		
Total Kjeldahl–N	EPA, Revised 1983: 351.3	Analytical Resources Incorportated
NH3–N	EPA, Revised 1983: 350.1	Analytical Resources Incorportated
NO2+NO3–N	EPA, Revised 1983: 353.2	Analytical Resources Incorportated
Total–P	EPA, Revised 1983: 365.3	Analytical Resources Incorportated
MISCELLANEOUS		
Oil and Grease (water)	EPA, Revised 1983: 413.1	Analytical Resources Incorportated
F–Coliform MF	APHA, 1989: 9222D.	Ecology
F–Coliform (soil/sed)	APHA, 1989: 9221A.	Ecology
T–Coliform (soil/sed)	APHA, 1989: 9221A.	Ecology
ORGANICS		
VOC (water)	EPA, 1986: 8260	Ecology
VOC (soil/sed)	EPA, 1986: 8240	Ecology
BNAs (water)	EPA, 1986: 8270	Ecology
BNAs (soil/sed)	EPA, 1986: 8270	Ecology
Pest/PCB (water)	EPA, 1986: 8080	Ecology
Pest/PCB (soil/sed)	EPA, 1986: 8080	Ecology
METALS		
PP Metals (water)	EPA, Revised 1983: 200–299	Ecology
PP Metals (soil/sed)	EPA, Revised 1983: 200–299	Ecology
BIOASSAYS		
Salmonid (acute 100%)	Ecology, 1981.	Ecology
Microtox (acute)	Beckman, 1982	Ecology
Ceriodaphnia (chronic)	EPA 1989: 1002.0	Ecology
Fathead Minnow (chronic)	EPA 1989: 1000.0	Ecology

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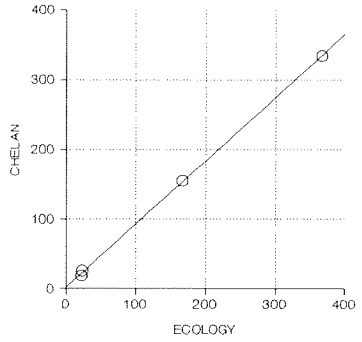
Appendix D - Priority Pollutant Cleaning and Field Transfer Blank Procedures - Chelan STP, 1992.

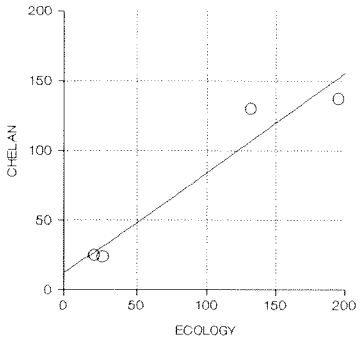
PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO_3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

Appendix E - Linear Regression Analysis of Split Samples - Chelan STP, 1992



I Plot of Linear Regression Function - TSS



II Plot of Linear Regression Function - BOD_5

Parameter	Pearson Correlation Coefficient	Function Coefficients	Standard Error*	Probability Level**
SOLIDS				
TSS: Chelan = Y_intercept + Slope(Ecology)	1.00			0.014
Y-intercept		2.54		
Slope		0.91	0.011	
OXYGEN PARAMETERS				
BOD_5: Chelan = Y_intercept + Slope(Ecology)	0.97			0.172
Y-intercept		12.39		
Slope		0.71	0.137	

* Standard errors of the coefficients

** Probability that linear regression function differs from line with slope of 1 and Y-intercept of 0.

Appendix F – Typical Design Information for Primary Sedimentation Tanks △ – Chelan STP, 1992

Item	Design Criteria		Chelan Inspection Data
	Range	Typical	
Plant Flow (MGD)			
Average			1.04
Peak			1.77
Primary Settling Followed By Secondary Treatment			
Clarifier Diameter (ft)	33.6*		40
Clarifier Depth (ft)	8.5**		10
Weir Length (ft)			239
Overflow Rate (gal/ft²·day)			
Average Flow	800–1200		1005
Peak Hourly Flow	2000–3000	2500	1417
Volume (gal)			94000
Weir Loading (gal/ft·day)	10,000–40,000	20,000	8,300
Detention Time (hours)	1.5–2.5	2.0	2.2***

△ Taken from Mcgraw Hill, Inc., 1991.

* Calculated from the minimum recommended overflow rate and Chelan average daily flow rate with Chelan Hourly Peak Flow Ratio.

** Calculated from 40 ft diameter, minimum recommended retention time, and average overflow rate.

*** Calculated using average daily flow rate

Appendix G – VOA, BNA, Pesticide/PCB and Metals Scan Results – Chelan STP, 1992.

Location:	Inf-1	Inf-2	RBC-Inf-1	RBC-Inf-2	Ef-1	Ef-2	Sludge-1	Sludge-2
Type:	grab	grab	grab	grab	grab	grab	grab	grab
Date:	7/28	7/28	7/28	7/28	7/28	7/28	7/28	7/29
Time:	0915	1630	1030	1425	1050	1550	0940	1055
Lab Log#:	318080	318081	318087	318088	318090	318091	318101	318102
VOA Compounds	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/Kg	ug/Kg
Carbon Tetrachloride	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Acetone	83	260	90	110	15	19	670 J	810 U
Chloroform	3	3	1	3	0.5 J	0.9 J	51 UJ	70 U
Benzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	21 J
1,1,1-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Bromomethane	1 U	1 U	1 U	1 U	0.3 J	1 U	51 UJ	70 U
Chloromethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Dibromomethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Bromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Chloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Vinyl Chloride	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Methylene Chloride	1 U	1 U	1 U	1 U	1 U	1 U	32 J	20 U
Carbon Disulfide	5 U	1 U	1 U	1 U	1 U	1 U	200 J	29 J
Bromoform	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Bromodichloromethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,1-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
1,1-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Trichlorofluoromethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
Dichlorodifluoromethane	1 U	5 U	5 U	5 U	5 U	5 U	51 UJ	70 UJ
1,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
2-Butanone (MEK)	2 U	2 J	3 J	4 J	4 J	2 J	170 J	260 J
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Trichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,2,3-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 UJ
Hexachlorobutadiene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 UJ
Naphthalene	1 U	1 U	1 U	1 U	1 U	1 U	1300 J	480 U
2-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	520 J	70 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	130 J	70 U
1,2,4-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	1400 J	70 U
1,2-Dibromo-3-Chloropro	5 U	5 U	5 U	5 U	5 U	5 U	51 U	70 U
1,2,3-Trichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
tert-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U

Inf Influent
Ef Effluent
grab Grab sample.
RBC Rotating Biological Contactor

U Analyte not detected at or above the reported estimate.
J The analyte was positively identified. The associated numerical value is an estimate.

Appendix G – VOA, BNA, Pesticide/PCB and Metals Scan Results – Chelan STP, 1992.

Location:	Inf-1	Inf-2	RBC-Inf-1	RBC-Inf-2	Ef-1	Ef-2	Sludge-1	Sludge-2
Type:	grab	grab	grab	grab	grab	grab	grab	grab
Date:	7/28	7/28	7/28	7/28	7/28	7/28	7/28	7/29
Time:	0915	1630	1030	1425	1050	1550	0940	1055
Lab Log#:	318080	318081	318087	318088	318090	318091	318101	318102
VOA Compounds	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/Kg	ug/Kg
Isopropylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	59 J	70 U
p-Isopropyltoluene	7	3	40	1 U	1 U	1 U	160000	260 U
Ethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	74 J	70 U
Styrene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Propylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	160 J	70 U
Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
4-Chlorotoluene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,4-Dichlorobenzene	2	2	1	1 U	0.5 J	1 U	1200 J	70 U
1,2-Dibromoethane (EDB)	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,2-Dichloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
4-Methyl-2-Pentanone (M	1 U	1 U	1 U	1 U	1 U	1 U	54	70 U
1,3,5-Trimethylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	570 J	6 J
Bromobenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Toluene	2 U	2 U	30	22	23	7	9000	5400
Chlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	116 J	9 J
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 UJ
Dibromochloromethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Tetrachloroethene	1 U	0.3 J	1 U	1 U	1 U	1 U	8 J	70 U
sec-Butylbenzene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,3-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	95 J	70 U
1,1-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
2,2-Dichloropropane	1 U	1 U	1 U	1 U	1 U	1 U	51 UJ	70 U
2-Hexanone	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
1,1,1,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 U
Total Xylenes	1 U	1 U	1 U	1 U	1 U	1 U	490 J	70 U
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 UJ
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	1 U	1 U	51 U	70 UJ

Inf Influent
Ef Effluent
grab Grab sample.
RBC Rotating Biological Contactor

U Analyte not detected at or above the reported estimate.
J The analyte was positively identified. The associated numerical value is an estimate.

Appendix G – VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) – Chelan STP, 1992.

Location:	Inf-E	RBC-Inf-E	Ef-E	Sludge-1	Sludge-2
Type:	E-Comp	E-Comp	E-Comp	grab	grab
Date:	7/28-29	7/28-29	7/28-29	7/28	7/29
Time:	@	@	@	0940	1055
Lab Log#:	318082	318089	318095	318101	318102
BNA Compounds	ug/L	ug/L	ug/L	ug/Kg	ug/Kg
Benzo(a)Pyrene	7 U	7 U	1 UJ	1700 J	8700 U
2,4-Dinitrophenol	84 UJ	84 UJ	17 UJ	50000 UJ	110000 UJ
Dibenzo(a,h)Anthracene	17 U	17 U	3 UJ	9000 U	22000 U
Benzo(a)Anthracene	7 U	7 U	1 U	6300	8700 U
4-Chloro-3-Methylphenol	34 U	34 U	7 U	20000 UJ	45000 U
Benzoic Acid	84 UJ	84 UJ	0.9 J	50000 UJ	110000 UJ
Hexachloroethane	7 U	7 U	1 U	3800 U	8700 U
Hexachlorocyclopentadiene	34 U	34 U	7 U	20000 UJ	45000 UJ
Isophorone	7 U	7 U	1 U	2400 J	730 J
Acenaphthene	7 U	7 U	0.03 J	3800 U	8700 U
Diethyl Phthalate	8	6 J	0.5 J	3800 U	8700 U
Di-n-Butyl Phthalate	7 U	1 U	0.1 J	3800 U	8700 U
Phenanthrene	0.4 J	0.3 J	0.09 J	3900	8700 U
Butylbenzyl Phthalate	3 J	3 U	0.2 J	19000	22000 U
N-Nitrosodiphenylamine	84 U	84 U	17 U	50000 UJ	110000 UJ
Fluorene	7 U	7 U	0.04 J	1000 UJ	8700 U
Carbazole	34 UJ	34 UJ	7 UJ	20000 UJ	45000 UJ
Hexachlorobutadiene	17 U	17 U	3 U	9700 U	22000 U
Pentachlorophenol	34 U	34 U	7 U	20000 UJ	110000 UJ
2,4,6-Trichlorophenol	17 U	17 U	3 U	9700 UJ	22000 U
2-Nitroaniline	17 U	17 U	3 UJ	9700 UJ	220000 UJ
2-Nitrophenol	17 U	17 U	3 U	9700 UJ	22000 U
1-Methylnaphthalene	7 U	7 U	0.08 J	1700 J	8700 U
Naphthalene	7 U	7 U	1 U	3800 U	8700 U
2-Methylnaphthalene	7 U	7 U	1 U	1200 J	8700 U
2-Chloronaphthalene	7 U	7 U	1 U	3800 U	8700 U
3,3'-Dichlorobenzidine	170 U	170 U	34 U	97000 U	220000 U
2-Methylphenol	7 U	7 U	0.2 J	3800 UJ	8700 U
1,2-Dichlorobenzene	7 U	7 U	1 U	3800 U	8700 U
o-Chlorophenol	7 U	7 U	1 U	3800 UJ	8700 U
2,4,5-Trichlorophenol	34 U	34 U	7 U	19000 UJ	44000 U
Nitrobenzene	7 UJ	7 UJ	0.08 J	3800 U	8700 U
3-Nitroaniline	84 UJ	84 UJ	17 UJ	REJ	REJ

Inf Influent
Ef Effluent
E Ecology sample.
RBC Rotating Biological Contactor
Sludge Sludge sample.
grab Grab sample.

U The analyte not detected at or above the reported estimate.
J The analyte was positively identified. The associated numerical value is an estimate.
UJ The analyte was not detected at or above the reported estimated result.
REJ The data was unusable for all purposes.

@ Composite sample times: 08:00 – 08:00

Appendix G – VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) – Chelan STP, 1992.

Location:	Inf-E	RBC-Inf-E	Ef-E	Sludge-1	Sludge-2
Type:	E-Comp	E-Comp	E-Comp	grab	grab
Date:	7/28-29	7/28-29	7/28-29	7/28	7/29
Time:	@	@	@	0940	1055
Lab Log#:	318082	318089	318095	318101	318102
BNA Compounds	ug/L	ug/L	ug/L	ug/Kg	ug/Kg
4-Nitroaniline	84 U	84 U	17 U	50000 U	110000 U
4-Nitrophenol	42 UJ	42 UJ	8 UJ	50000 UJ	110000 UJ
Benzyl Alcohol	20 J	14 J	27 U	20000 UJ	45000 UJ
4-Bromophenyl Phenylether	7 U	7 U	1 U	3800 U	8700 U
2,4-Dimethylphenol	7 U	7 U	1 U	3800 UJ	8700 UJ
4-Methylphenol	0.5 J	8	28	3800 UJ	2000 J
1,4-Dichlorobenzene	1 J	7 U	0.2 J	1500 J	8700 U
4-Chloroaniline	84 UJ	84 UJ	17 UJ	50000 UJ	110000 UJ
Phenol	7 U	7 U	2	3800 UJ	8700 U
Bis(2-Chloroethyl)Ether	7 U	7 U	1 U	3800 U	8700 U
Bis(2-Chloroethoxy)Methane	7 U	7 U	1 U	3800 U	8700 U
Bis(2-Ethylhexyl)Phthalate	38	32	7	190000	200000
Di-n-Octyl Phthalate	3 J	2 J	0.3 J	7300 J	8700 UJ
Hexachlorobenzene	7 U	7 U	1 U	3800 U	8700 U
Anthracene	7 U	7 U	1 U	3800 U	8700 U
1,2,4-Trichlorobenzene	7 U	7 U	1 U	3800 U	8700 U
2,4-Dichlorophenol	7 U	7 U	1 U	3800 UJ	8700 U
2,4-Dinitrotoluene	17 U	17 U	3 U	9700 U	22000 U
Pyrene	7 U	7 U	1 U	5800	1800 J
Dimethyl Phthalate	7 U	7 U	1 U	3800 U	8700 U
Dibenzofuran	7 U	7 U	1 U	3800 U	8700 U
Benzo(g,h,i)Perylene	7 U	7 U	1 UJ	3800 U	8700 U
Indeno(1,2,3-cd)Pyrene	7 U	7 U	1 UJ	3800 U	8700 U
Benzo(b)Fluoranthene	7 U	7 U	1 UJ	3800 U	1300 J
Fluoranthene	7 U	7 U	1 U	5700	1300 J
Benzo(k)Fluoranthene	7 U	7 U	1 UJ	5800	8700 U
Acenaphthylene	7 U	7 U	1 U	3800 U	8700 U
Chrysene	7 U	7 U	1 U	3400 J	8700 U
Retene	7 U	7 U	1 U	3800 U	8700 U
4,6-Dinitro-2-Methylphenol	84 U	84 U	17 U	50000 UJ	110000 UJ
1,3-Dichlorobenzene	7 U	7 U	1 U	3800 U	8700 U
2,6-Dinitrotoluene	17 U	17 U	3 U	9700 U	22000 U
N-Nitroso-di-n-Propylamine	7 U	7 U	1 U	3800 U	8700 U
4-Chlorophenyl Phenylether	7 U	7 U	1 U	3800 U	8700 U
Bis(2-Chloroisopropyl)Ether	7 U	7 U	1 U	3800 UJ	8700 UJ

Inf Influent
Ef Effluent
E Ecology sample.
RBC Rotating Biological Contactor
Sludge Sludge sample.

U The analyte not detected at or above the reported estimate.
J The analyte was positively identified. The associated numerical value is an estimate.
UJ The analyte was not detected at or above the reported estimated result.

grab Grab sample.
comp Composite sample.
@ Composite sample times: 08:00 – 08:00

Location:	Inf-E	RBC-Inf-E	Ef-E	Sludge-1	Sludge-2
Type:	E-Comp	E-Comp	E-Comp	grab	grab
Date:	7/28-29	7/28-29	7/28-29	7/28	7/29
Time:	@	@	@	0940	1055
Lab Log#:	318082	318089	318095	318101	318102
Pesticide/PCB Compounds	ug/L	ug/L	ug/L	ug/Kg	ug/Kg
alpha-BHC	0.013 U	0.014 U	0.013 U	160 U	360 U
beta-BHC	0.013 U	0.014 U	0.013 U	160 U	360 U
gamma-BHC (Lindane)	0.013 U	0.014 U	0.013 U	160 U	360 U
delta-BHC	0.013 U	0.014 U	0.013 U	160 U	360 U
Heptachlor	0.013 U	0.014 U	0.013 U	160 U	360 U
Aldrin	0.013 U	0.014 U	0.013 U	160 U	360 U
Heptachlor Epoxide	0.013 U	0.014 U	0.013 U	160 U	360 U
Endosulfan I	0.013 U	0.014 U	0.013 U	160 U	360 U
4,4'-DDE	0.013 U	0.014 U	0.013 U	160 U	360 U
Dieldrin	0.013 U	0.014 U	0.013 U	160 U	360 U
Endrin	0.013 U	0.014 U	0.013 U	160 U	360 U
Endosulfan II	0.013 U	0.014 U	0.013 U	160 U	360 U
4,4'-DDD	0.013 U	0.014 U	0.013 U	160 U	360 U
Endrin Aldehyde	0.013 U	0.014 U	0.013 U	160 U	360 U
4,4'-DDT	0.013 U	0.014 U	0.013 U	160 U	360 U
Endosulfan Sulfate	0.013 U	0.014 U	0.013 U	160 U	360 U
Endrin Ketone	0.0067 U	0.0068 U	0.0067 U	78 U	180 U
Methoxychlor	0.013 U	0.014 U	0.013 U	160 U	360 U
Chlordane	0.013 U	0.014 U	0.013 U	160 U	360 U
Toxaphene	0.67 U	0.68 U	0.67 U	7800 U	18000 U
Aroclor-1016	0.27 U	0.27 U	0.27 U	3100 U	7100 U
Aroclor-1221	0.27 U	0.27 U	0.27 U	3100 U	7100 U
Aroclor-1232	0.27 U	0.27 U	0.27 U	3100 U	7100 U
Aroclor-1242	0.13 U	0.14 U	0.13 U	1600 U	3570 U
Aroclor-1248	0.13 U	0.14 U	0.13 U	1600 U	3570 U
Aroclor-1254	0.27 U	0.27 U	0.27 U	3100 U	7100 U
Aroclor-1260	0.13 U	0.14 U	0.13 U	1600 U	3570 U

Inf Influent
Ef Effluent
E Ecology sample.
RBC Rotating Biological Contactor
Sludge Sludge sample.
@ Composite sample times: 08:00 – 08:00

U The analyte not detected at or above the reported estimate.
grab Grab sample.
comp Composite sample.

Appendix G – VOA, BNA, Pesticide/PCB and Metals Scan Results (cont.) – Chelan STP, 1992.

Location:		Inf-E	RBC-Inf-E	Ef-E	Sludge-1	Sludge-2	River-1	River-2
Type:		E-Comp	E-Comp	E-Comp	grab	grab	grab	grab
Date:		7/28-29	7/28-29	7/28-29	7/28	7/29	7/29	7/29
Time:		@	@	@	0940	1055	1240	1300
Lab Log#:		318082	318089	318095	318101	318102	318103	318104
Metals	Hardness = 60	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Antimony		30 U	30 U	30 U	150 UN	150 UN	30 U	30 U
Arsenic		2.2 P	2.1 P	1.6 P	287	938	1.5 U	1.5 U
Beryllium		1 U	1 U	1 U	5 U	5 U	1 U	1 U
Cadmium		0.56 B	0.58 B	0.26 PB	146	59 P	0.17 PB	0.73 B
Chromium		5 U	5 U	5 U	449	140	5 U	5 U
Copper		54.4	42.2 U	19	15800	7100	3 U	3 U
Lead		3 P	4 P	2.1 P	4570	1730	1 U	1 U
Mercury		0.094 PNB	0.063 PNB	0.065 PNB	0.152 N	0.03 PNB	0.05 UNB	0.05 UNB
Nickel		10 U	10 U	10 U	430	160 PNB	10 U	10 U
Selenium		2 U	2 U	2 U	75 N	33 N	2 U	2 U
Silver		5.01	4.7	2.4	2.5 NU	2.5 NU	0.5 U	0.5 U
Thallium		2.5 U	2.5 U	2.5 U	12.5 U	12.5 U	2.5 U	2.5 U
Zinc		93.9	85.8	41.7	43400	15500	9.5 P	6.1 P

Inf	Influent	U	The analyte not detected at or above the reported estimate.	grab	Grab sample.
Ef	Effluent			comp	Composite sample.
E	Ecology sample.	J	The analyte was positively identified. The associated numerical value is an estimate.	B	Analyte was also found in the analytic method blank indicating that the sample may have been contaminated.
RBC	Rotating Biological Contactor	UJ	The analyte was not detected at or above the reported estimated result.	N	For metals analytes the spike sample recovery is not within control limits.
Sludge	Sludge sample.	@	Composite sample times: 08:00 – 08:00	P	The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.
River	Yakima River sample.				

Appendix H - Tentatively Identified Compounds (TIC), Chelan STP 1992

Sample Location:	Inf-1
Type:	grab
Date:	7/28
Time:	0915
Sample ID:	318080

Volatile Organics:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Ethanol	3.5	NJ
2. Isopropyl alcohol	4.1	NJ
3. Acetaldahyde	1.3	NJ
4. Thiobismethane	3.1	NJ
5. .Beta.-Myrcene	3.9	NJ
6. Bicyclo[4.1.0]hept-2-E+	19	NJ
7. Dimethyldisulfide	12	NJ
8. Carene(1s,3s,6r)-(-)-,+	5.9	NJ
9. D-Limonene	480	NJ
10. 3-Carene	3.1	NJ

Sample Location:	Inf-2
Type:	grab
Date:	7/28
Time:	1630
Sample ID:	318081

Volatile Organics:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Unknown Compound	200	NJ
2. Ethanol	5.5	NJ
3. Isppropyl alcohol	9.7	NJ
4. Acetaldehyde	1.3	NJ
5. Thiobismethane	4.5	NJ
6. Benzenemethanol, .Alph+	2.8	NJ
6. Dimethyldisulfide	13	NJ
7. D-Limonene	40	NJ

NJ There is evidence that the analyte is present. The associated numerical result is an estimate.

\+ Additional nomenclature.

Sample Location: Inf-E
Type: comp
Date: 7/28-29
Time: 24 hours
Sample ID: 318082

BNAs:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Cyclohexene	110	NJ
2. 2-(2-Butixyethoxy)Ethanol	170	NJ
3. Tetradecanoic Acid	96	NJ
4. Unknown Compound 1	570	NJ
5 Unknown Compound 2	160	NJ
6. Hexadecanoic Acid	1300	NJ
7. Oleic Acid	870	NJ
8. Octadecanoic Acid	1200	NJ
9. (3.Alpha)Cholestan-3-OL	320	NJ
10. Cholesterol	300	NJ
11. Caffeine	21	NJ
12. Didecanoic Acid	20	NJ
13. Heptadecanoic Acid	59	NJ

Sample Location: RBC-Inf-1
Type: grab
Date: 7/28
Time: 1030
Sample ID: 318087

Volatile Organics:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Ethanol	0.68	NJ
2. Isopropyl alcohol	3.0	NJ
3. Acetaldehyde	0.26	NJ
4. Thiobismethane	7.3	NJ
5. Cyclohexanol, 5-Methyl+	14	NJ
6. 4-Heptanone	0.74	NJ
7. Bicyclo[4.1.0]Hept-2-E+	3.9	NJ
8. Dimethyldisulfide	7.3	NJ
9. D-Limonene	56	NJ

Sample Location: RBC-Inf-2
Type: grab
Date: 7/28
Time: 1425
Sample ID: 318088

Volatile Organics:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. Ethanol	1.2	NJ
2. Isopropyl alcohol	3.7	NJ
3. Acetaldehyde	0.35	NJ
4. Thiobismethane	5.4	NJ
5. Bicyclo[4.1.0]Hept-2-E+	6.8	NJ
6. Dimethyldisulfide	7.6	NJ
7. D-Limonene	100	NJ
8. 3-Carene	3.3	NJ

Sample Location: RBC-Inf-E
Type: comp
Date: 7/28-29
Time: 24 hours
Sample ID: 318089

BNAs:

Compound Name	Estimated Concentration (µg/L)	Qualifier
1. a-Terpeneol	47	NJ
2. Tetradecanoic Acid	130	NJ
3. (3.Alpha)Cholestan-3-OL	270	NJ
4. Cholesterol	220	NJ
5. Caffeine	13	NJ
6. Heptadecanoic Acid	59	NJ
7. Pentadecanoic Acid	53	NJ
8. Hexadecanoic Acid	2100	NJ
9. Octadecanoic Acid	3400	NJ
10. Oleic Acid	2300	NJ

Sample Location: Ef-1
Type: grab
Date: 7/28
Time: 1050
Sample ID: 318090

Volatile Organics:

Compound Name	Estimated Concentration (μg/L)	Qualifier
1. Ethanol	0.22	NJ
2. Acetaldahyde	0.42	NJ
3. D-Limonene	3.6	NJ

Sample Location: EF-E
Type: comp
Date: 7/28-29
Time: 24 hours
Sample ID: 318095

BNAs:

Compound Name	Estimated Concentration (μg/L)	Qualifier
1.		
2. Tetradecanoic Acid	18	NJ
3. Octadecanoic Acid	350	NJ
4. Unknown Compound 1	12	NJ
5. Hexadecanoic Acid	110	NJ
6. Heptadecanoic Acid	12	NJ
7. (3.Alpha)Cholestan-3-OL	46	NJ
8. Caffeine	1.2	NJ
9. Pentadecanoic Acid	5.5	NJ
10. Oleic Acid	200	NJ

Sample Location: Sludge-1
Type: grab
Date: 7/29
Time: 0940
Sample ID: 318101

Volatile Organics:

Compound Name	Estimated Concentration (µg/Kg)	Qualifier
1. Bicyclo[4.1.0]Heptane+	850	NJ
2. Dimethyldisulfide	450	NJ
3. Cyclohexane, (1-methyl+	130	NJ
4. Bicyclo[3.1.1]Hept-2-E+	490	NJ
5. Octane, 2,3,7-Trimethy+	86	NJ
6. Decane, 2,5,6-Trimethy+	220	NJ

BNAs:

Compound Name	Estimated Concentration (µg/Kg)	Qualifier
1. Hexadecanoic Acid	3900000	NJ
2. Octadecanoic Acid	4400000	NJ
3. 2-Nonylphenol	1100000	NJ
4. Benzene, 1-methyl-3-(1+	140000	NJ
5. Tetradecanoic Acid	170000	NJ
6. Chlorestan-3-OL, Acetat+	380000	NJ
7. Unknown Compound 1	31000	NJ
8. Cholestan-3-Ol, (3.Alp+	890000	NJ
9. Cholest-3-ene, (5.alph+	520000	NJ

Sample Location: Sludge-2
Type: grab
Date: 7/29
Time: 1055
Sample ID: 318102

Volatile Organics:

Compound Name	Estimated Concentration (µg/Kg)	Qualifier
1. Bicyclo[2.2.1]Hept-2-E+	540	NJ
2. Dimethyldisulfide	810	NJ
3. Hexane, 2,4,4-Trimethy+	470	NJ
4. Hexane, 2,2,3,4,5,5-He+	550	NJ
5. Decane, 2,6,7-Trimethy+	750	NJ

BNAs:

Compound Name	Estimated Concentration (µg/Kg)	Qualifier
1. 2-Cyclohexen-1-ONE, 3,+	75000	NJ
2. 9-Hexadecanoic Acid	3300000	NJ
3. Tetradecanoic Acid, 12+	31000	NJ
4. Squalene	2700000	NJ
5. 10-Octadecanoic Acid, +	99000	NJ
6. 9-Hexadecanoic Acid, M+	77000	NJ
7. 9-Hexadecanoic Acid, M+	75000	NJ